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OF THE LAURENTIAN GREAT LAKES

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FOREWORD

Environmental measurements are required to determine the quality of ambient water, the character of effluents, and the effects of pollutants on aquatic life. The Environmental Monitoring and Support Laboratory - Cincinnati conducts research to develop, evaluate, and promulgate methods to:

- Measure the presence and concentration of physical, chemical and radiological pollutants in water, wastewater, bottom sediments, and solid waste.
- Concentrate, recover, and identify enteric viruses, bacteria, and other microorganisms in water.
- Measure the effects of pollution on freshwater, estuarine, and marine organisms, including the phytoplankton, zooplankton, periphyton, macrophyton, macroinvertebrates, and fish.
- Automate the measurement of the physical, chemical, and biological quality of water.
- Conduct an Agency-wide quality assurance program to assure standardization and quality control of systems for monitoring water and wastewater.

The effectiveness of measures taken to restore and maintain the biological integrity of the Nation's surface waters is dependent upon the level of our understanding of the changes in the taxonomic composition of the aquatic life caused by discharges of toxic substances and other pollutants. Rotifers are important components of aquatic food webs and, because of their short life cycles, are very sensitive to changes in environmental conditions. This manual contains taxonomic keys and descriptions for 167 species of rotifers, and is highly illustrated with photomicrographs and drawings. Also included are guidelines for sample collection and analysis, notes on the ecology and distribution of the species, and an extensive bibliography. The manual fills a long-standing need for a comprehensive taxonomic reference to the common species of planktonic rotifers in the Great Lakes, and will be widely useful to biologists in determining the integrity of zooplankton communities.

Dwight G. Ballinger
Director
Environmental Monitoring and
Support Laboratory - Cincinnati

ABSTRACT

This guide to Laurentian Great Lakes rotifers treats 38 genera, which include 167 taxa. Major emphasis is given to planktonic and near-shore members of the Class Monogononta. The guide briefly covers materials and methods used in collecting, preparing and counting rotifer samples, as well as techniques used in examining rotifer trophi and preparing permanent rotifer mounts. Major anatomical identification characteristics of rotifers are also discussed. In addition to a key to genera, keys are given for major species, along with ecological and taxonomic notes. Descriptions for each taxon incorporate photomicrographs, line drawings, and pertinent biometric data. The appendix is a compilation of all rotifers reported for the Great Lakes and includes synonyms, authors and dates of species, and the investigators who reported the species.

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ABBREVIATIONS

AIS	anterointermediate dorsal spine length
ALS	anterlateral dorsal spine length
AMS	anteromedian dorsal spine length
BL	body length, excluding appendages
DALS	distance between anterolateral spines
DPL	dorsal plate length
DPW	dorsal plate width
LD	lorica depth (distance from dorsal to ventral surface)
LL	lorica length, including anterior and posterior spines
LW	lorica width
PE	posterior extension
PLS	posterolateral spine length
PND	posterior notch depth
PS	posterior spine length
TL	total length, including all appendages and processes
VPL	ventral plate length
VPW	ventral plate width
W/L	ratio of lorica width to lorica length

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SECTION 1

INTRODUCTION

The purpose of this guide is to provide a practical reference for identification of major female rotifers of the Laurentian Great Lakes of the Class Monogononta. Males are not treated in the guide since they are rarely encountered in planktonic species. For additional information on males, and the rotifer life cycle, the reader should consult Ruttner-Kolisko, 1974. The Class Digononta (Bdelloidea) is only briefly discussed.

Approximately 275 species of rotifers have been reported for the Great Lakes (Appendix A). Most of these species occur in littoral and benthic environments. This guide treats 167 species, about half of which commonly occur in the plankton.

Since the emphasis is on planktonic forms, only common littoral genera are included in the generic key. This limitation is advantageous in one respect; it reduces the size of the key and number of couplets necessary to determine a genus in question. The only disadvantage is that the key will not cover all genera which may be collected in beach pools, benthic environments, inland lakes or acid waters. The guide is primarily intended for identification of rotifers collected in the Great Lakes near-shore and pelagic environments.

The species keys are complete for reported species of eulimnetic genera such as *Synchaeta*, *Keratella* and *Notholca* but keys for large littoral genera such as *Lecane*, *Monostyla*, or *Trichocerca* do not include all species reported for the Great Lakes. These keys are designed to identify the most likely encountered species and to serve as a reference for taxonomic characteristics of species not included in the guide. In some genera, species that have been included are common in inland lakes of the region but have not been reported for the Great Lakes.

Major taxonomic treatises found in the European literature describe most of the species known to North America (Voigt, 1957; Bartoš, 1959; Rodewald-Rudesco, 1960;

Kutikova, 1970). These references should be consulted for species not covered in this guide.

This guide is divided into six major sections. Section 1 defines the taxonomic scope of the guide. Section 2 provides information on methods and materials used in collecting, preparing and counting rotifer samples, as well as techniques used in examining rotifer trophi and in preparing permanent mounts. Section 3 includes a description of major rotifer identification characteristics. A list of species can be found in Section 4 and a key to major genera is presented in Section 5. Section 6 includes keys to species, with ecological and taxonomic notes and photomicrographs. This section is arranged alphabetically according to genus to facilitate location of a particular genus or species. A checklist of reported species with synonyms is provided in Appendix A.

SECTION 2

METHODS AND MATERIALS

Collecting Samples

Van Dorn bottles, Kemmerer bottles or Niskin bottles with a capacity of 5 liters or more are very effective for collecting quantitative rotifer samples. Bottle samples can be easily poured into a pail through a plankton bucket fitted with small mesh nylon screening (Likens and Gilbert, 1970). A large metal or plastic funnel placed over the plankton bucket prevents spills when transferring samples from the bottle to the bucket. The water temperature can be measured in the pail and the filtrate used to wash the screening on the plankton bucket.

Other collection methods may be used but they may not be as effective. Water pumps have the advantage of allowing a large volume of water to be collected within a short time but may have disadvantages such as physical damage to the organisms and selective avoidance by the larger, stronger swimming species (Edmondson and Winberg, 1971). The Shindler-Patalas plankton trap is not generally suited for sampling in large lakes since pitching and rolling of the vessel cause the doors of the trap to open and close. This problem can be alleviated by placing a lid over the net aperture (Schindler, 1969). Long net tows are not recommended for quantitative rotifer samples since small mesh conical nets (No. 20-25) have poor filtration efficiencies.

Preparing Samples

In preparing rotifer samples, many soft-bodied species should be fully extended before attempting identification. Specimens may be relaxed satisfactorily by adding carbonated water to the concentrated sample in a ratio of 1:20 parts lake water, and allowing the sample to stand for 10 minutes (Gannon and Gannon, 1975). Edmondson (1959) also lists other narcotizing agents. Relaxants may make identification of loricate species difficult, however, since the extended corona obscures the shape or spination of the anterior margin which is of taxonomic importance. When possible, living specimens should be brought back to the laboratory and examined with a compound microscope so that the investigator can become familiar with the contracted shapes of the species. Samples can be permanently preserved in 5% buffered formalin.

Counting Samples

A compound microscope (100 x) should be used for enumerating rotifers. Subsamples can be easily counted in a 1- to 5- ml plexiglass counting cell covered with a glass slide. Three 1-ml subsamples (extracted with an automatic pipette from the volume-adjusted concentrate) combined in a 3-ml counting cell can yield coefficients of variation below 20%. Each pooled subsample should include 100-200 rotifers. A minimum of two pooled subsamples should be counted per sample for statistical reliability. If abundance is low, the sample can be further concentrated or a total count can be performed.

Examining Trophi

To examine rotifer trophi (mouthparts) use a pipette to transfer the specimen with a small drop of water onto a glass slide. Place a cover glass over the specimen and locate it under low power of a compound microscope. Add a drop of fresh bleach to the edge of the cover glass so that the bleach flows around the specimen. If necessary, draw the bleach with a piece of tissue paper to make it flow. After a few minutes the soft tissues will be completely dissolved, leaving the sclerotized mouthparts free for examination. The mouthparts can be manipulated to the desired position by lightly tapping the cover glass. Where the unci are needed for identification, the trophi should be flattened by compressing the cover glass against the glass slide with the tip of a pencil.

Preparing Permanent Mounts

To prepare a permanent mount, isolate preserved specimens with a micropipette, and serially wash them in a spot depression plate to remove associated plankton or other debris. Transfer rotifers to depression spots containing a few drops of 10% glycerine. Several rotifers can be placed in one depression. Place in a dustproof chamber overnight to allow the water to evaporate from the mixture. Evaporation can be speeded with a drying oven, but if the change to 100% glycerine is made too rapidly this may result in distortion of the rotifer, especially in species with a poorly developed lorica. The minimal evaporation time is probably two hours.

After the preserved specimen is situated in a medium of 100% glycerine, it is ready to be mounted. Glass slides for the permanent mount are best prepared the previous day by placing four small drops of clear nail polish on the slide to provide supports for the cover glass (Figure 1). Supports can also be made with four small chips broken from a cover glass.

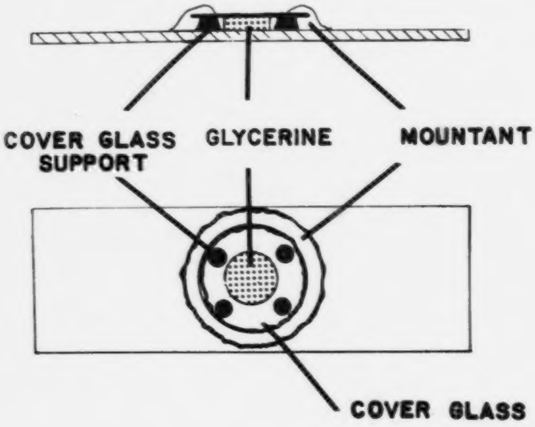


Figure 1. Permanent mounts

When slides and supports are in place, put one drop of 100% glycerine in the center of the cover glass supports, being careful not to entrap any air bubbles in the drop. The drop should be small enough that it will not be extruded once the cover glass is in place. Transfer the specimen to the drop of glycerine on the permanent mount with a minute insect pin (available from entomological equipment dealers) inserted into a wooden applicator. Form the tip of the pin into a tiny hook by tapping it on a desk top. Manipulate the specimen into the crook at the tip of the pin and lift it out in a drop of the viscous glycerine. Push the specimen down through the glycerine on the permanent mount to the surface of the glass slide with the insect pin.

When the specimen is in place, put a clean cover glass on the drop of glycerine, being careful to avoid entrapping air bubbles. Apply a mountant medium (polyvinyl lactophenol, Hyrax, Permount, Euparal, Canada balsam, etc.) to the edge of the cover glass with a small diameter glass rod. Capillary action will draw the mountant in around the glycerine. Apply the mountant around the cover glass to seal (avoid trapping air bubbles). Make sure the mountant extends over the top edge of the cover glass to insure an airtight seal. Before the mountant begins to thicken, the cover glass can be moved slightly to manipulate the specimen to the desired position.

Rotifers with a well-developed lorica can be directly mounted in a drop of liquified glycerine jelly on a glass slide. Place a cover glass over the specimen.

SECTION 3

MAJOR ANATOMICAL CHARACTERISTICS OF ROTIFERS

Since the basic anatomy and ultrastructure of rotifers have been described and reviewed in previous works (Hyman, 1951; Clement, 1977), this section is limited to a brief description of major characteristics used for identification.

Rotifer species include both soft-bodied and loricate forms. The lorica is a stiffened intracellular rigid lamina of the body wall composed of scleroprotein. The lorica may be continuous or separated into plates. Associated with the lorica is a soft extracellular cuticle (a glycoprotein) which probably forms the gelatinous layer in some species. The degree of stiffness of the lorica varies considerably even among species of the same genera. This variability can present some difficulty in identifying the presence of lorica in a species. Spines, thickened ridges on the body surface, facets, plates or a distinctive rigid body outline indicate the presence of a lorica as the term is used in this guide. Basic external characteristics used for identification are depicted in Figure 2.

The corona, known as the wheel organ of the Digononta (bdelloid rotifers), is composed of the ciliated buccal field, circumapical band and the unciliated apical field (Figure 3). The corona, which functions in locomotion and feeding, is well furnished with sensory receptors, and may have fan-like or finger-like lobes. A coronal sheath may envelop the corona and is often marked by distinctive lateral folds; it is usually constricted posteriorly by a furrow. The ciliation and shape of the corona is of taxonomic value although it is not used extensively in this guide.

Trophi vary considerably among different rotifer genera, and are therefore of taxonomic importance. The trophi (composed of a mucopolysaccharide) include seven basic parts: paired rami, unci, and manubria, and a single fulcrum. The trophi treated in the guide are of seven basic types: malleate, virgate, forcipate, incudate, malleoramate, uncinate, and ramate.

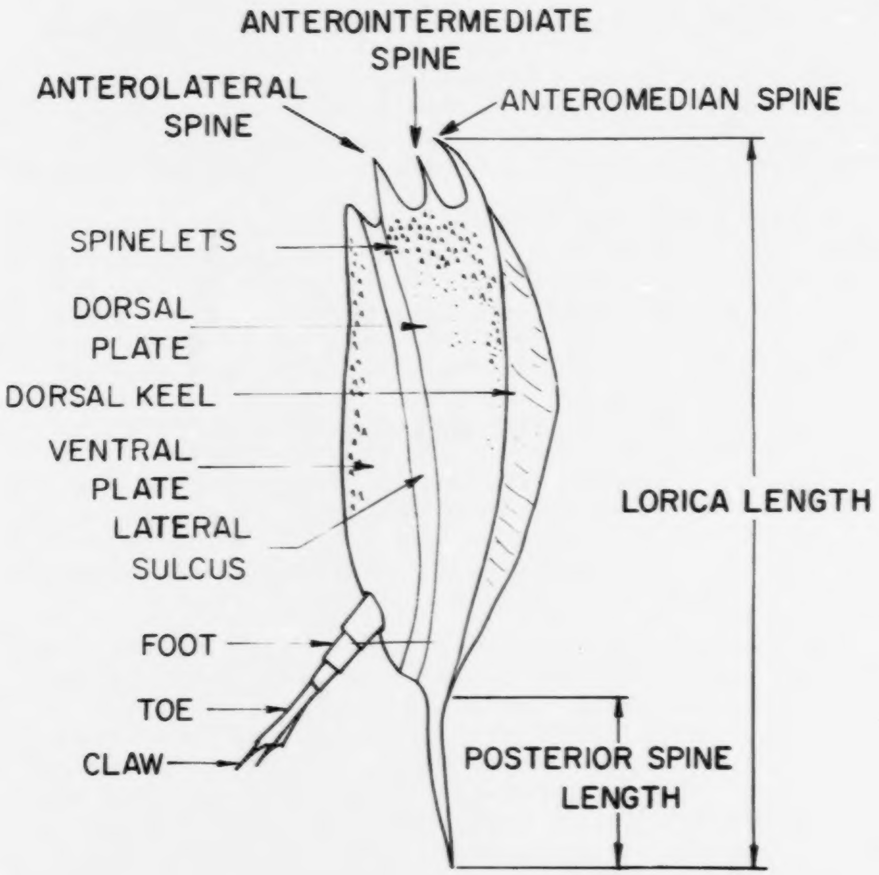

ANTEROINTERMEDIATE SPINE
ANTEROLATERAL SPINE
ANTEROMEDIAN SPINE
SPINELETS
DORSAL PLATE
DORSAL KEEL
VENTRAL PLATE
LATERAL SULCUS
FOOT
TOE
CLAW
LORICA LENGTH
POSTERIOR SPINE LENGTH

Figure 2. Generalized loricate rotifer.

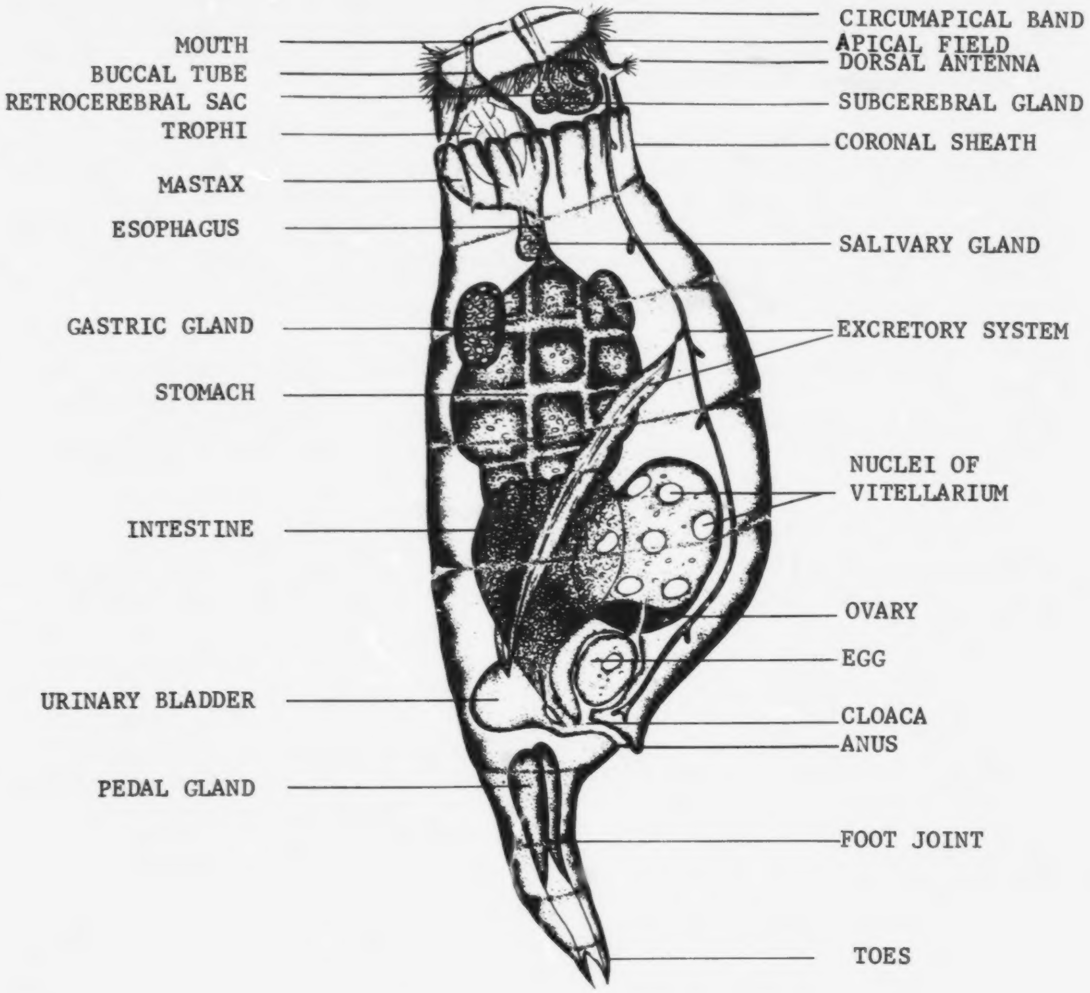

MOUTH
BUCCAL TUBE
RETROCEREBRAL SAC
TROPHI
MASTAX
ESOPHAGUS
GASTRIC GLAND
STOMACH
INTESTINE
URINARY BLADDER
PEDAL GLAND
CIRCUMAPICAL BAND
APICAL FIELD
DORSAL ANTENNA
SUBCEREBRAL GLAND
CORONAL SHEATH
SALIVARY GLAND
EXCRETORY SYSTEM
NUCLEI OF VITELLARIUM
OVARY
EGG
CLOACA
ANUS
FOOT JOINT
TOES

Figure 3. Generalized soft-bodied rotifer and basic anatomy.

Malleate trophi are the most generalized type. All component parts function in grinding, grasping and pumping (Figure 4).

The primary function of virgate trophi is pumping. The toothed, platelike unci are used to grasp and pierce the cell or body wall of prey. The fulcrum is highly elongated and directed posteriorly. Manubria are elongate and cauda are directed in the same plane as the fulcrum. Rami form a domelike structure (Figure 5).

Forcipate and incudate trophi function in grasping. Toothed rami are elongated and forcepslike and can be thrust out from the mastax to capture prey. In forcipate trophi the uncus is usually developed as an elongated, pointed tooth. The manubria are developed and the fulcrum is long (Figures 6, 7). Unci and manubria are highly reduced in incudate trophi and the fulcrum is short (Figure 8).

Malleoramate trophi probably function in grinding. Unci often have several large teeth with expanded tips and many fine elongated teeth. Manubria are without cauda and are located laterally along the length of the rami (Figure 9).

Uncinate trophi most likely function in tearing or shredding. Manubria and fulcrum are reduced and the small unci, usually with one to three large teeth (subunci), are attached to the rami (Figure 10). This type occurs only in the Order Collothecaceae.

Ramate trophi probably function mainly in grinding. Unci are platelike and crescent-shaped with many elongated teeth which are located over the rami. Manubria lie in close proximity to the unci and the fulcrum is short or absent (Figure 11). Ramate trophi are closely related to the malleoramate type and occur only in the Class Digononta (Bdelloidea).

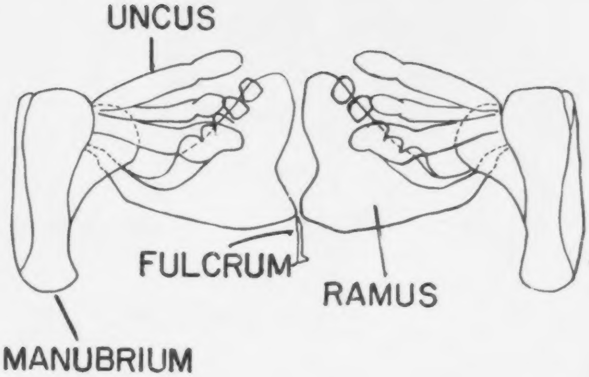

UNCUS
FULCRUM
RAMUS
MANUBRIUM

Figure 4. Malleate trophi; *Notholca* (original drawing).

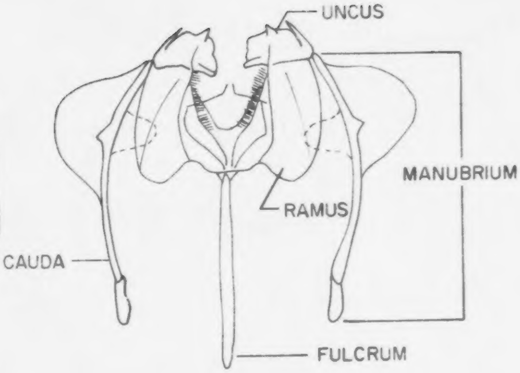

UNCUS
MANUBRIUM
RAMUS
CAUDA
FULCRUM

Figure 5. Virgate trophi; *Synchaeta* (original drawing).

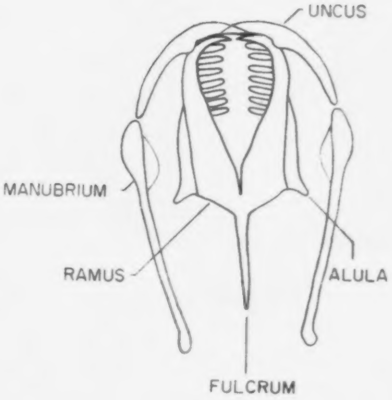

UNCUS
MANUBRIUM
RAMUS
ALULA
FULCRUM

Figure 6. Forcipate trophi; *Dicranophorus* (redrawn from Harring and Myers, 1927).

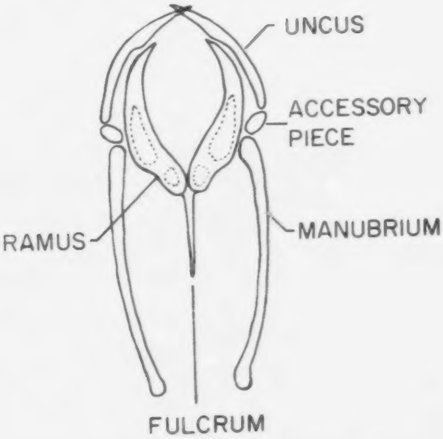

UNCUS
ACCESSORY PIECE
RAMUS
MANUBRIUM
FULCRUM

Figure 7. Forcipate trophi; *Encentrum* (redrawn from Harring and Myers, 1927).

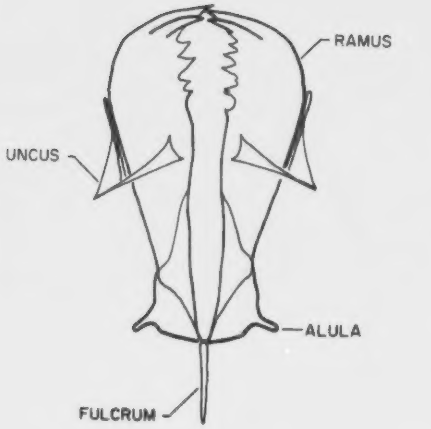

RAMUS
UNCUS
ALULA
FULCRUM

Figure 8. Incudate trophi; *Asplanchna* (original drawing).

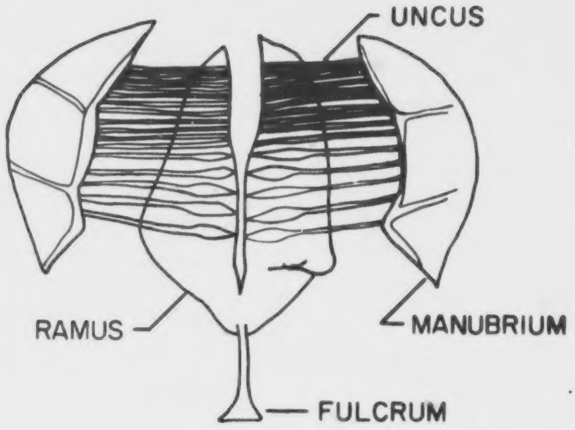
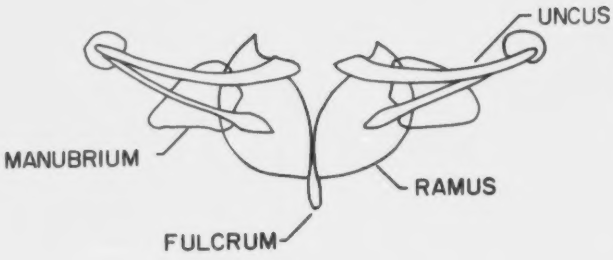

UNCUS
RAMUS
MANUBRIUM
FULCRUM

Figure 9. Malleoramate trophi; *Conochiloides* (redrawn from Ahlstrom, 1938).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RAMUS
FULCRUM

Figure 10. Uncinate trophi; Collothecaceae (redrawn from; The invertebrates: Acanthocephala, Aschelminthes and Entoprocta. The pseudocoelomate Bilateria. Vol. III. L.H. Hyman. 1951. Used with permission of McGraw-Hill Book Company.)

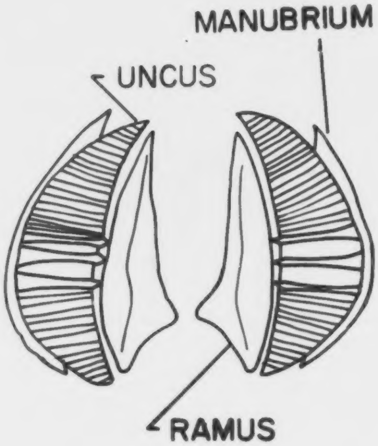

MANUBRIUM
UNCUS
RAMUS

Figure 11. Ramate trophi; Digononta (original drawing)

SECTION 4

LIST OF SPECIES TREATED IN GUIDE

CLASS MONOGONONTA

Order Ploima

Family Brachionidae

Subfamily Brachioninae

Anuraeopsis fissa (Gosse 1851)
A. navicula Rousselet 1911
Brachionus angularis Gosse 1851
B. bidentata Anderson 1899
B. budapestinensis Daday 1885
B. calyciflorus Pallas 1766
B. caudatus Barrois and Daday 1894
B. havanaensis Rousselet 1911
B. quadridentatus Hermann 1783
B. rubens Ehrbg. 1938
B. urceolaris Müller 1773
B. variabilis Hempel 1896
Dipleuchlanis propatula (Gosse 1886)
Euchlanis alata Voronkov 1911
E. calpidia (Myers 1930)
E. dilatata Ehrbg. 1832
E. meneta Myers 1930
E. parva Rousselet 1892
E. pellucida Harring 1921
E. triquetra Ehrbg. 1838
Kellicottia bostoniensis (Rousselet 1908)
K. longispina (Kellicott 1879)
Keratella cochlearis cochlearis (Gosse 1851)
K. cochlearis f. *tecta* (Gosse 1851)
K. cochlearis var. *faluta* Ahlstrom 1943
K. cochlearis var. *hispida* (Lauterborn 1898)
K. cochlearis var. *robusta* (Lauterborn 1900)

K. crassa Ahlstrom 1943
K. earlinae Ahlstrom 1943
K. hiemalis Carlin 1943
K. irregularis (Lauterborn 1898)
K. mixta (Oparina-Charitonova 1924)
K. quadrata (Müller 1786)
K. serrulata f. *curvicornis* (Rylov 1926)
K. taurocephala Myers 1938
K. testudo (Ehrbg. 1832)
K. ticinensis (Callerio 1920)
K. valga f. *tropica* (Apstein 1907)
Lophocharis oxysternon (Gosse 1851)
L. salpina (Ehrbg. 1834)
Manfredium eudactylotum (Gosse 1886)
Mytilina ventralis var. *brevispina* (Ehrbg. 1832)
M. ventralis var. *macracantha* (Gosse 1886)
Notholca acuminata (Ehrbg. 1832)
N. acuminata var. *extensa* Olofsson 1918
N. caudata Carlin 1943
N. foliacea (Ehrbg. 1838)
N. labis Gosse 1887
N. laurentiae Stemberger 1976
N. michiganensis Stemberger 1976
N. squamula (Müller 1786)
N. squamula "large form"
Platyias patulus (Müller 1786)
P. quadricornis (Ehrbg. 1832)
Trichotria pocillum (Müller 1776)
T. tetractis (Ehrbg. 1830)

Subfamily Colurinae

Colurella obtusa (Gosse 1886)
C. uncinata (Müller 1773)
Lepadella acuminata (Ehrbg. 1834)
L. cristata (Rousselet 1893)
L. ehrenbergi (Perty 1850)
L. ovalis (Müller 1786)
L. patella (Müller 1773)
L. rhomboides (Gosse 1886)
L. triptera Ehrbg. 1830

Family Lecanidae

Lecane clara (Bryce 1892)
L. crepida Harring 1914
L. flexilis (Gosse 1886)
L. inermis (Bryce 1892)
L. inopinata Harring and Myers 1926
L. intrasinuata (Olofsson 1917)
L. leontina (Turner 1892)
L. ligona (Dunlop 1901)
L. ludwigi (Eckstein 1883)
L. luna (Müller 1776)
L. mira (Murray 1913)
L. mucronata Harring and Myers 1926
L. ohioensis (Herrick 1885)
L. pyrrha Harring and Myers 1926
L. signifera (Jennings 1896)
L. stichaea Harring 1913
L. stokesi (Pell 1890)
L. tenuiseta Harring 1914
L. tudicola Harring and Myers 1926
L. ungulata (Gosse 1887)
Monostyla bulla Gosse 1886
M. closterocerca Schmarda 1895
M. copeis Harring and Myers 1926
M. cornuta (Müller 1786)
M. crenata Harring 1913
M. lunaris (Ehrbg. 1832)
M. obtusa Murray 1913
M. quadridentata Ehrbg. 1832
M. stenroosi Meissner 1908

Family Proalidae

Proales decipiens (Ehrbg. 1832)
P. sordida Gosse 1886

Family Notommatidae

Cephalodella auriculata (Müller 1773)
C. gibba (Ehrbg. 1832)
C. intuta Myers 1924
Notommata aurita (Müller 1786)
N. copeus Ehrbg. 1834

Family Trichocercidae

Trichocerca bicristata (Gosse 1887)
T. capucina (Wierzejski and Zacharias 1893)
T. cylindrica (Imhof 1891)
T. elongata (Gosse 1886)
T. iernis (Gosse 1887)
T. insignis (Herrick 1885)
T. insolens (Myers 1936)
T. lata (Jennings 1894)
T. longiseta (Shrank 1805)
T. lophoessa (Gosse 1886)
T. mucosa (Stokes 1896)
T. multicrinis (Kellicott 1897)
T. porcellus (Gosse 1886)
T. pusilla (Jennings 1903)
T. rattus (Müller 1776)
T. rousseleti (Voigt 1901)
T. similis (Wierzejski 1893)

Family Gastropidae

Ascomorpha ecaudis Perty 1850
A. ovalis (Bergendal 1892)
A. saltans Bartsch 1870)
Gastropus hyptopus (Ehrbg. 1838)
G. stylifer Imhof 1891

Family Dicranophoridae

Dicranophorus caudatus (Ehrbg. 1834)
D. forcipatus (Müller 1786)
D. mesotis Harring and Myers 1928
Encentrum felis (Müller 1773)
E. saundersiae (Hudson 1885)
Wierzejkiella velox (Wisniewski 1932)

Family Tylotrochidae

Tylotrocha monopus (Jennings 1894)

Family Asplanchnidae

Asplanchna brightwelli Gosse 1850
A. herricki de Guerne 1888
A. priodonta Gosse 1850

Family Synchaetidae

Ploesoma hudsoni (Imhof 1891)
P. lenticulare Herrick 1885
P. triacanthum (Bergendal 1892)
P. truncatum (Levander 1894)
Polyarthra dolichoptera Idelson 1925
P. euryptera Wierzejski 1893
P. major Burckhardt 1900
P. remata Skorikov 1896
P. vulgaris Carlin 1943
Synchaeta asymmetrica Koch-Althaus 1963
S. grandis Zacharias 1832
S. kitina Rousselet 1902
S. lakowitziana Lucks 1930
S. oblonga Ehrbg. 1832
S. pectinata Ehrbg. 1832
S. stylata Wierzejski 1893
S. tremula (Müller 1786)

Order Flosculariacea

Family Testudinellidae

Filinia brachiata (Rousselet 1901)
F. longiseta (Ehrbg. 1834)
F. terminalis (Plate 1886)
Pompholyx sulcata Hudson 1885
Testudinella parva (Ternetz 1892)
T. patina f. *triloba* (Herman 1783)
T. reflexa (Gosse 1887)

Family Hexarthridae

Hexarthra mira (Hudson 1871)

Family Conochilidae

Conochiloides dossuarius (Hudson 1885)
C. natans (Seligo 1900)
Conochilus hippocrepis (Shrank 1803)
C. unicornis Rousselet 1892

Order Collothecaceae

Family Collothecidae

Collotheca mutabilis (Hudson 1885)
C. pelagica (Rousselet 1893)
Stephanoceros fimbriatus (Goldfuss 1820)

CLASS DIGONONTA (BDELLOIDEA)

Order Bdelloida

Family Philodinidae

Macrotrachela sp.
Rotaria sp.

SECTION 5

KEY TO MAJOR ROTIFER GENERA OF THE LAURENTIAN GREAT LAKES

1	With paired germovitellaria; trophi ramate	42
	With single germovitellarium; trophi otherwise ...	2
2(1)	Body wall thickened (lorica stiffened), may be somewhat flexible or with vesiculate (bubbly) texture	3
	Body wall thin and flexible (lorica weakly developed)	4
3(2)	Foot or foot opening present (foot may be retracted within lorica)	6
	Foot absent	21
4(2)	Foot present without defined foot opening (foot may be retracted against body)	27
	Foot absent	5
5(4)	Featherlike, armlike or bristlelike appendages (not setae) arising from body wall	39
	Without body wall appendages (except for setae); body oblate, spheroid or oblong	40
6(3)	Body not bilaterally symmetrical but twisted and fusiform; coronal sheath present with spines or folds; toes spinelike and usually unequal in length; virgate trophi asymmetrical: *Trichocerca* (p. 138)	
	Body bilaterally symmetrical	7
7(6)	Anterior margin of body with spines or cusps......	10
	Anterior margin of body without spines; folds or a short broad-based anteromedian process may be present	8

8(7) Foot annulated (corrugated appearance) or smooth without joints (folds may be present on anterior margin of body) 9
Foot jointed or segmented (folds absent) 12

9(8) Dorsal surface of lorica with distinctive ridge pattern or with vesiculate texture; foot terminates in two toes and arises from the ventromedian surface; short broad anteromedian process may be present: *Ploesoma* (p. 112)
Dorsal surface smooth 19

10(7) With two short toes; foot long; anterior margin with spines 11
With one or two long toes; foot short or long; anterior margin with two spines or with two small anterolateral spinelike processes 12

11(10) Foot annulated; anterior margin with two, four, or six spines; posterior spines may be present or absent: *Brachionus* (p. 36)
Foot segmented; anterior margin with two or ten spines; two or four posterior spines present: *Playtias* (p. 110)

12(8, 10) Lorica divided laterally or medially by membranes or cleft 13
Lorica not divided (one piece) 14

13(12) Lorica separated into dorsal and ventral plates .. 16
Lorica separated by fissure or cleft on dorsal or ventral surface 17

14(12) First foot segment with two spines; foot clearly divided into three segments; two toes about 100 μm long; lorica armorlike: *Trichotria* (p. 145)
First foot segment without spines 15

15(14) Posterior margin of lorica obliquely truncated in lateral view; anterior margin often with fine serrated edge; dorsal keel prominent; foot terminates in two pointed toes; lorica may be thin and flexible: *Lophocharis* (p. 92)
Posterior margin of lorica not obliquely truncated in lateral view; anterior margin not serrated; foot clearly divided into three segments and terminates in two pointed toes; opening at anterior margin narrow, semicircular or v-shaped; lorica rigid: *Lepadella* (p. 89)

16(13) Dorsal plate of lorica arched or domed; foot short with two long flattened toes; toes never with claws or spurs: *Euchlanis* (p. 57)
Body compressed dorsoventrally; foot jointed, indistinct and very short; one or two long flattened toes often terminating in claws or spurs 18

17(13) Lorica divided by fissure on dorsal surface: *Mytilina* (p. 98)
Lorica divided by fissure on ventral surface: *Colurella* (p. 46)

18(16) Foot with single toe: *Monostyla* (p. 94)
Foot with two toes: *Lecane* (p. 82)

19(9) Body outline round or ovate 20
Body outline spindle-shaped 33

20(19) Body laterally compressed; foot arises from ventral surface and terminates in one or two small toes (foot may be retracted); dorsal antennae small but prominent: *Gastropus* (p. 65)
Body dorsoventrally compressed; distal end of foot truncated without toes: *Testudinella* (p. 136)

21(3) Anterior margin of lorica with spines 22
Anterior margin of lorica without spines 24

22(21) Anterior spines long (>100 µm); asymmetrical anterior spines and a single posterior spine highly elongated and pointed; lorica surface smooth: *Kellicottia* (p. 69)
Anterior spines short (<70 µm) 23

23(22) Arched dorsal plate of lorica with distinct polygonal facets; ventral plate flattened; one or two posterior spines usually present: *Keratella* (p. 71)
Dorsal plate with fine longitudinal or wavy striations (plate juncture not well defined); anterior margin of dorsal plate with six spines, ventral plate with six folds; body oblong or rounded; a single truncated or pointed posterior extension of lorica may be present: *Notholca* (p. 100)

24(21) Lorica divided into dorsal and ventral plates by membrane 25
Lorica not divided into distinct plates 26

25(24) Body dorsoventrally flattened; dorsal plate slightly larger than ventral plate; body ovate; four dark circular bodies usually visible in stomach; lorica surface smooth: *Ascomorpha* (= *Chromogaster*) (p. 29)
Dorsal plate arched, ventral plate flattened; anterior margin of dorsal plate notched; anterior margin of ventral plate slightly concave; body size small; large egg may be present, carried against ventral plate: *Anuraeopsis* (p. 27)

26(24) Anterior margin of lorica with small pleatlike folds; two longitudinal furrows in thin lorica; body ovate; virgate trophi: *Ascomorpha* (p. 29)
Anterior margin of lorica without folds; longitudinal furrows absent; anterodorsal margin with single smoothly curved protuberance; anteroventral margin with v-shaped median notch; body circular in outline and usually with four lobes in cross-sectional view; posteroventral margin with small circular opening through which an egg may be externally attached by a gelatinous thread; malleoramate trophi: *Pompholyx* (p. 122)

27(4) Foot long, without toes (foot may be retracted against body in preserved specimens); foot may be smooth or wrinkled, slender or corpulent 28

Foot terminates with one or more toes (toes spinelike in some species) 31

28(27) Paired lateral antennae, fused or separate, arising from apical field or from anterolateral body wall 29

Prominent lateral antennae absent 30

29(28) A single fused or two separate antennae located in a conically-domed apical field; corona disc-like with ventral notch; may occur in colonies: *Conochilus* (p. 51)

Two long antennae arising from lateral body wall; corona disc-like with ventral notch; foot and part of upper body enclosed in a gelatinous envelope (not always visible): *Conochiloides* (p. 48)

30(28) Five long pointed coronal lobes bearing setae arranged in a spiral: *Stephanoceros* (p. 126)

Coronal lobes short or absent; lobes may be contracted and only hairlike setae visible; foot long, slender and contractile: *Collotheca* (p. 44)

31(27) Foot annulated with single short conical toe; two bulges at midsection of body; body constricted immediately posterior to coronal region; internal organs may be colored a reddish-purple: *Tylotrocha* (p. 147)

Foot with two or more toes 32

32(31) Toes spinelike and usually of unequal length; body and trophi (virgate) asymmetrical; pleatlike folds in epidermis at anterior margin; spinelike processes at anterior margin of coronal sheath often present: *Trichocerca* (p. 138)

Two toes of equal length, not spinelike 33

33(19, 32) Toes minute, often not visible due to retraction of foot in preserved specimens; living specimens have conical body shape; bristlelike setae on apical field may be visible; trophi encompassed by well-developed v-shaped (hypopharyngeal) muscles; fully contracted specimens appear as small balls; virgate trophi: *Synchaeta* (p. 128)

Toes short or long, body spindle-shaped or fusiform with distinct neck region; corona obliquely oriented on anteroventral body margin 34

34(33) Foot (excluding toes) about one-fourth total body length; disc-like pieces located between unci and manubria; unci needlelike; tips of rami with teeth; forcipate trophi: *Wierzejkiella* (p. 149)

Foot (excluding toes) much shorter than one-fourth total body length 35

35(34) Trophi forcipate 36

Trophi virgate or malleate 37

36(35) Disc-like pieces between unci and manubria; fulcrum variable in length; toes short; alulae not prominent: *Encentrum* (p. 55)

Without disc-like pieces between unci and manubria; fulcrum short and rami often with shearing teeth along inner margin; alulae prominent in many species; toes variable in length, often slightly recurved ventrad: *Dicranophorus* (p. 53)

37(35) Toes long and recurved; epidermis may be thickened in some species so that a lateral fissure is evident; foot unjointed; virgate trophi: *Cephalodella* (p. 42)

Toes short, not recurved; epidermis thin; foot usually with two jointlike folds 38

38(37) Trophi virgate; uncus platelike, having one or two large teeth with smaller rudimentary teeth; rami often asymmetrical; inner margin of ramus often serrated; fulcrum long: *Notommata* (p. 108)

Trophi malleate with virgate appearance; uncus usually with four to eight teeth not differing greatly in size (may appear platelike); first teeth generally largest; rami symmetrical; inner margin of ramus not serrated but two or three small teeth may be present; fulcrum short: *Proales* (p. 124)

39(5) One posterior and two long anterior bristlelike appendages: *Filinia* (p. 62)

Four sets of paddlelike or featherlike outgrowths arising from anterior portion of body: *Polyarthra* (p. 115)

Six armlike projections arising from body wall, having long setae inserted distally: *Hexarthra* (p. 67)

40(5) Body large (>500 µm), transparent, and oblate; no intestine; incudate trophi: *Asplanchna* (p. 32)

Body small (<300 µm), opaque, and pear-shaped, spheroid or ellipsoid 41

41(40) Body pear-shaped; four dark spherical bodies usually visible in stomach; zoochlorellae may be present in body cavity; virgate trophi: *Ascomorpha* (p. 29)

Body spheroid or ellipsoid; setae may project from anterior of body: Contracted *Synchaeta*, *Collotheca*, *Conochilus* or other illoricate rotifer

42(1) Class Digononta. Benthic rotifers occasionally common at the outfalls of polluted rivers entering the Great Lakes (p. 151).

SECTION 6

KEYS AND DESCRIPTIVE NOTES FOR SPECIES

This section is arranged alphabetically according to genus for the convenience of the reader. Photomicrographs are presented to give a view of the rotifer as it appears under bright-field optics of a compound microscope. The entire rotifer is not always in sharp focus because of the limited depth of field of the optical system. Line drawings are presented where good specimens were not available for photography or where high power magnification was necessary (such as for trophi).

In addition to measurements taken in the laboratory, biometric data was also obtained from Harring and Myers (1922, 1924, 1926, 1927); Myers (1930); Ahlstrom (1940, 1943); Berzins (1951); Voigt (1957); and Ruttner-Kolisko (1974). A list of abbreviations used for biometric data is presented in the Abbreviations section.

Descriptions of some genera include keys while others do not. Keys were omitted for those genera which contain a large number of species but which have only a few representative species included in the guide. In other instances, species are included in the plates, but are not treated in the keys or descriptions. These "additional" species are often common members of inland lakes and ponds but are uncommon or not known to occur in the Great Lakes. They have been included simply to broaden the scope of the guide for use in inland waters.

A brief presentation of common genera of the Class Digononta (Bdelloidea) appears at the end of this section.

GENUS *ANURAEOPSIS* LAUTERBORN 1900 (malleate trophi)

Two species of *Anuraeopsis* have been encountered in the Great Lakes area. *Anuraeopsis navicula* often co-occurs with *A. fissa* in northern lower Michigan inland lakes but only *A. fissa* has been reported for the Great Lakes. Both species are warm stenotherms which occur during late spring, summer and early fall and show promise as eutrophic indicator species (Gannon and Stemberger, 1978).

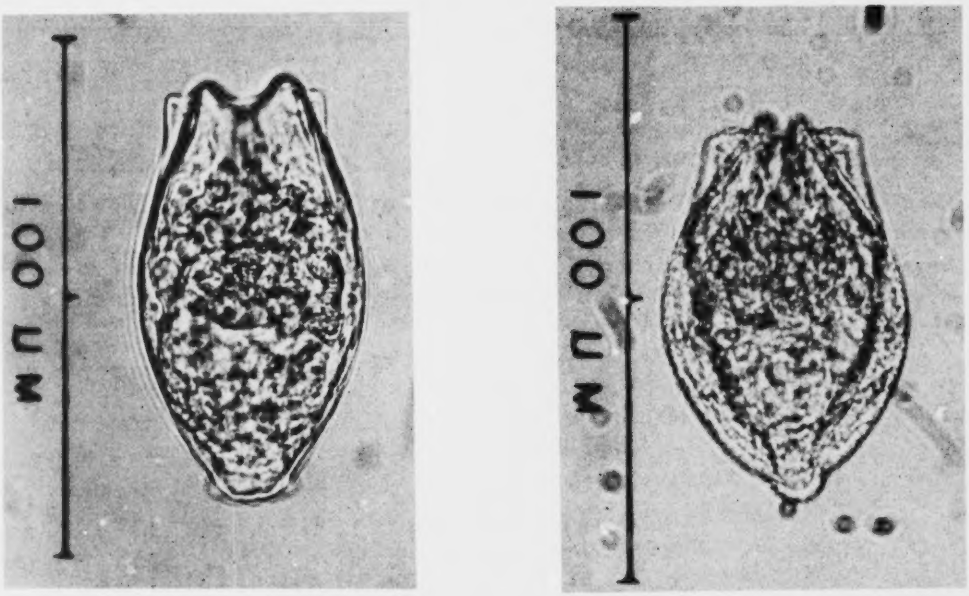
Anuraeopsis fissa is reported to feed on detritus and its associated bacteria (Pourriot, 1965*a*, 1977).

Additional reference: Sudzuki, 1964.

Reported Species

Anuraeopsis fissa: lorica surface smooth; lorica length (LL) 90-120 µm.

Anuraeopsis navicula: lorica surface granular; LL 70-100 µm.


100 UM
100 UM

A. fissa, dorsal view

A. navicula, dorsal view

Plate 1. *Anuraeopsis* species.

GENUS *ASCOMORPHA* PERTY 1850 (virgate trophi)

Two *Ascomorpha* species, *A. ecaudis* and *A. saltans*, occur from spring through fall but neither species commonly occurs in the pelagic environment of the Great Lakes. *Ascomorpha saltans* feeds on chrysomonads and peridiniens (de Beauchamp, 1932; Wesenberg-Lund, 1930) and often appears during blooms of *Ceratium*, on which it also feeds (Ruttner-Kolisko, 1974). *Ascomorpha ecaudis* feeds on the green flagellates and chrysomonads. Green flagellates can live and multiply in the body cavity and hypodermis, imparting a green or brown coloration to the body (Pourriot, 1965*a*). The algal cells are eventually digested intracellularly (de Beauchamp, 1932).

Ascomorpha ovalis (=? *Chromogaster testudo*) differs from other members of the genus because of its thickened lorica. The species was previously placed in the genus *Chromogaster*, but was later incorporated into the *Ascomorpha* by Carlin (1943). The species is most common during fall in the Great Lakes but may occur during spring and winter in inland lakes. It feeds primarily on *Ceratium* and *Peridinium* (Pourriot, 1965*a*).

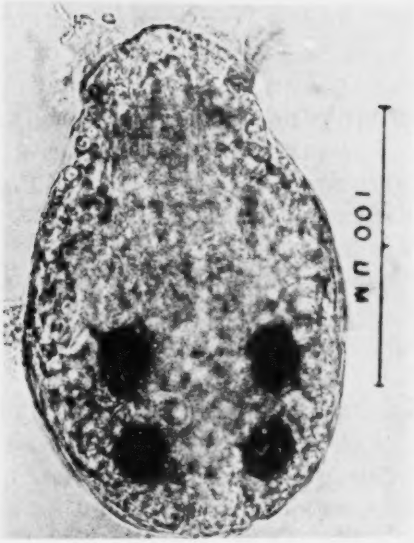
Additional reference: Sudzuki, 1964.

Reported Species

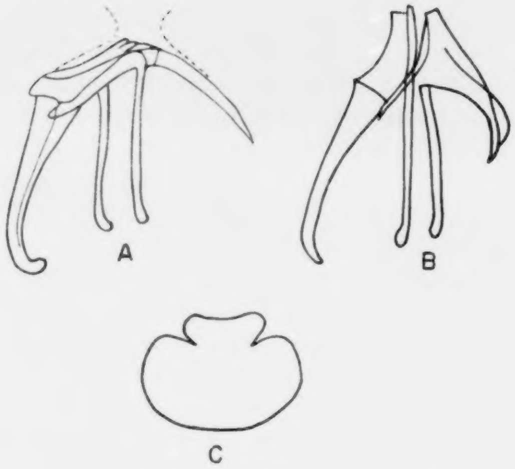
Ascomorpha ecaudis: body without lorica; zoochlorellae often present, giving a greenish appearance to the body; four dark circular bodies present in stomach; body length (BL) 130-200 μm.

Ascomorpha saltans: body pear-shaped, with thin lorica having two longitudinal folds (grooves); trilobate in cross-sectional view; folds visible in anterior margin of body when corona retracted; BL 95-150 μm.

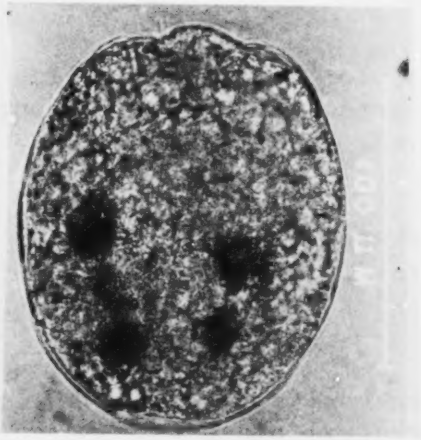
Ascomorpha ovalis (= *Chromogaster ovalis* =? *C. testudo*): body ovoid with distinct dorsal and ventral plates separated by a flexible membrane; four dark circular bodies often visible in stomach; LL 100-200 μm.



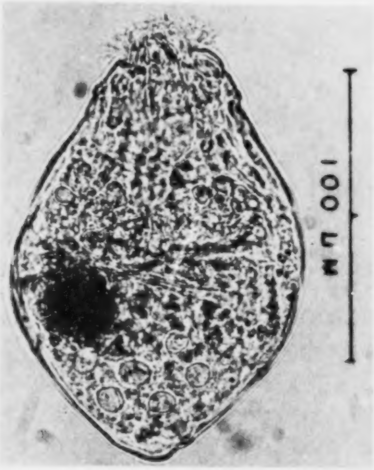
A. ecaudis (corona extended)



a, *A. ecaudis* trophi, lateral view; *b*, *A. saltans* trophi, lateral view; *c*, *A. saltans*, cross-sectional view (redrawn from de Beauchamp, 1932)

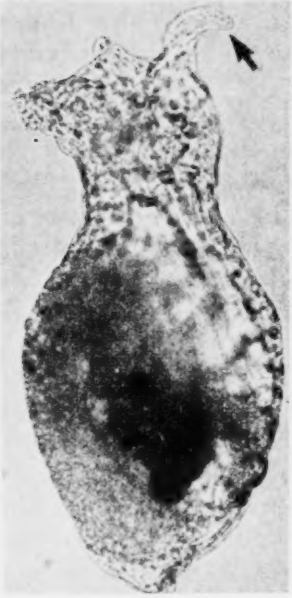


A. ecaudis (corona retracted)

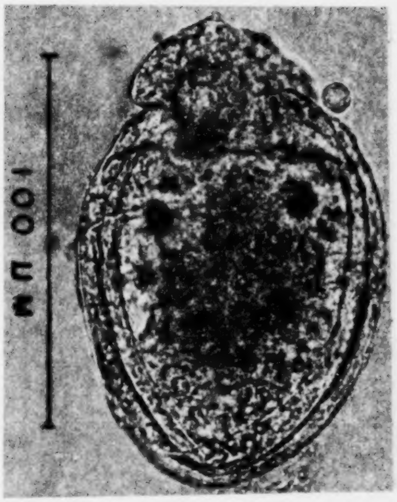


A. saltans

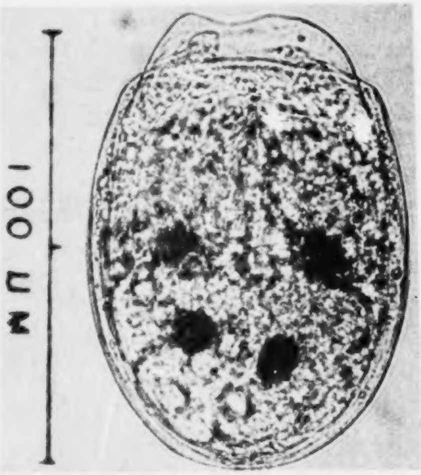
Plate 2. *Ascomorpha* species.



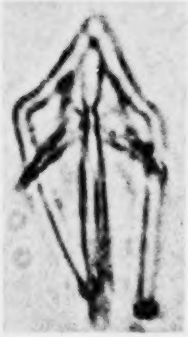
A. saltans, palp extended (indicated by arrow)



A. ovalis (corona extended)



A. ovalis (corona retracted)



A. ovalis trophi, ventral view

Plate 3. *Ascomorpha* species.

GENUS *ASPLANCHNA* GOSSE 1850 (incudate trophi)

Three *Asplanchna* species, *A. brightwelli, A. herricki* and *A. priodonta*, have been reported for the Great Lakes. In addition, *A. girodi* and *A. sieboldi* have been recorded for inland waters of the region (Chengalath, 1977; Stemberger, unpublished). The predominant species *A. priodonta* is probably present throughout the year, displaying peak abundance in spring and summer. *Asplanchna herricki*, which often co-occurs with *A. priodonta* in fall, also shows a spring maximum in inland lakes (Stemberger, unpublished). *Asplanchna brightwelli* was recorded in Saginaw Bay in July and November 1974 (Stemberger, Gannon and Bricker, 1979).

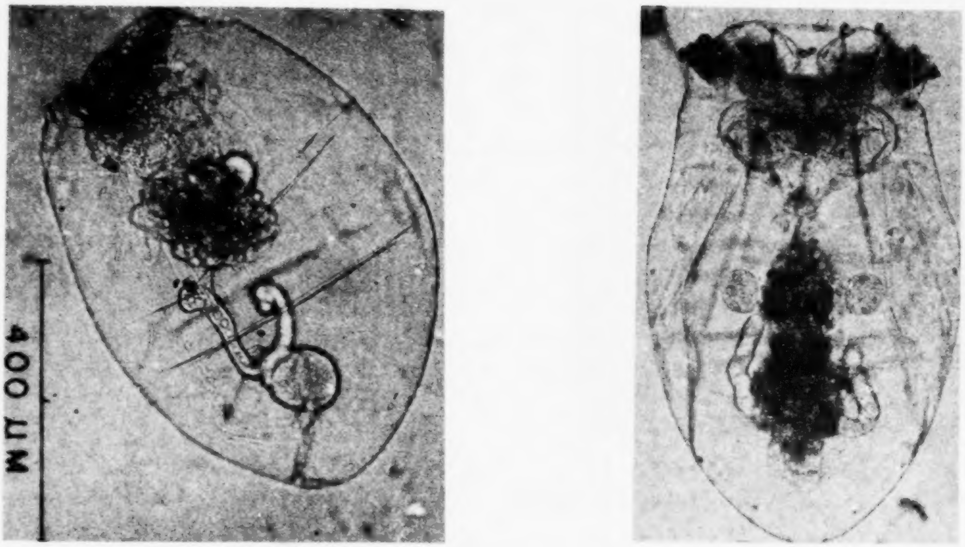
Asplanchna species are omnivores. *Asplanchna priodonta* feeds primarily on centric diatoms, *Melosira, Fragilaria* and *Tabellaria*, and dinoflagellates such as *Peridinium* and *Ceratium*. The major rotifer prey are *Keratella* and *Synchaeta* species with single posterior spines (Stemberger and Fuller, unpublished). Pejler (1977*a*) reported successful laboratory culture of *A. priodonta* on the small alga *Rhodomonas minuta*. The diet of *A. herricki* is similar to that of *A. priodonta* but *A. herricki* is more carnivorous and will also prey on bosminids (Stemberger and Fuller, unpublished). *Asplanchna brightwelli* feeds on green algae and diatoms and *Brachionus* and *Synchaeta* species are important rotifer prey (Salt, unpublished). Green and Lan (1974) reported cyclopoid nauplii and copepodids in the stomachs of *A. brightwelli*. Gilbert (1968) successfully cultured *A. brightwelli* on *Paramecium*.

Additional references: Gilbert, 1967; Ruttner-Kolisko, 1974: King, 1977; and Snell, 1977.

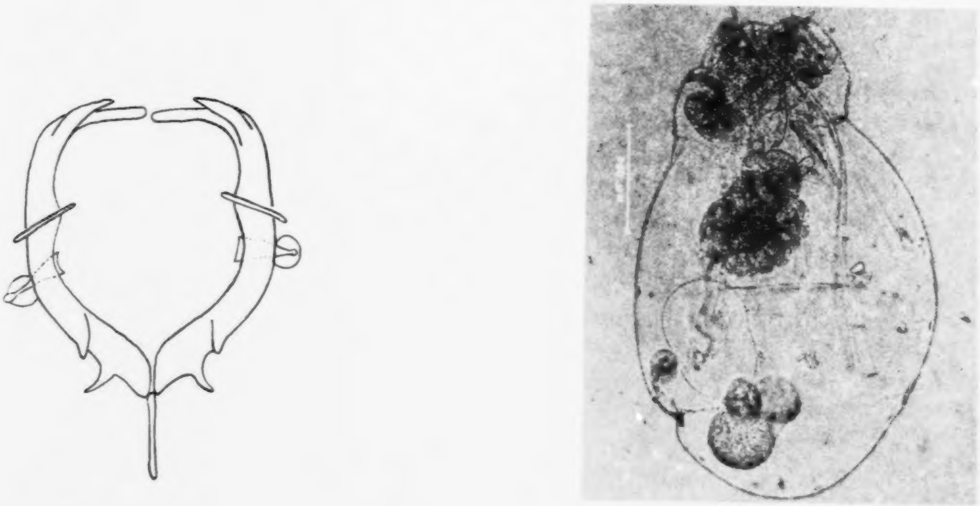
Key to Species

1 Vitellarium u-shaped; 16 nuclei in vitellarium; BL 500-1500 µm: *A. brightwelli*
Vitellarium spherical; 8 nuclei in vitellarium 2

2(1) With bilobed pedal gland; BL 500-1500 µm: *A. herricki*
Without pedal gland; BL 420-1500 µm: *A. priodonta*



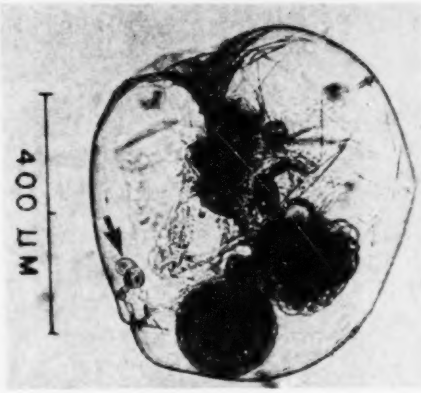
A. brightwelli *A. brightwelli*



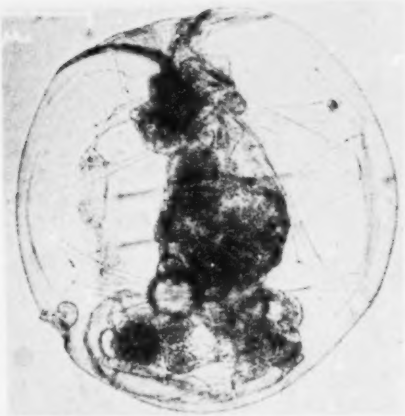
A. brightwelli trophi
(original drawing)

A. herricki

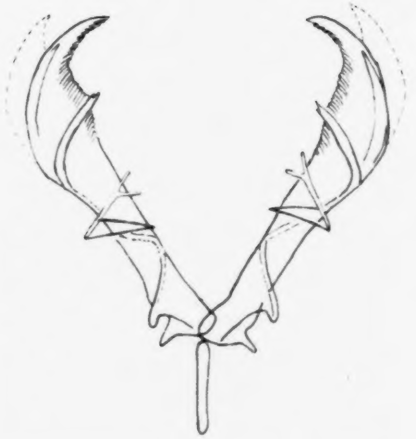
Plate 4. *Asplanchna* species.



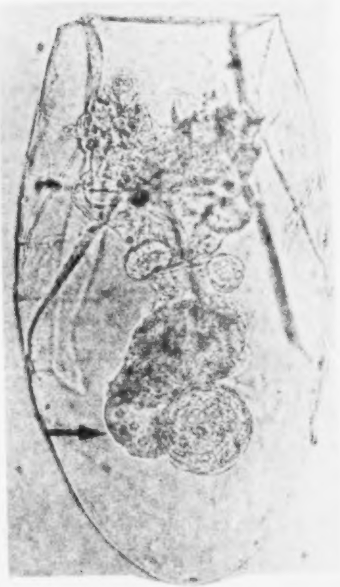
A. herricki, contracted (arrow indicates pedal gland)



A. herricki, contracted, with developing embryo

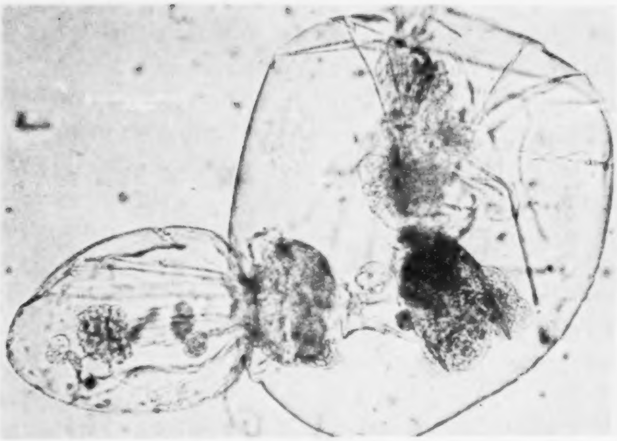


A. herricki trophi (original drawing)

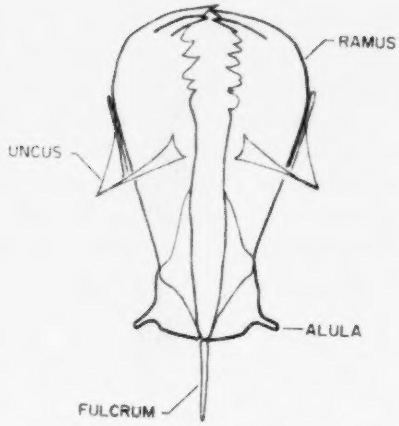


A. priodonta (arrow indicates vitellarium)

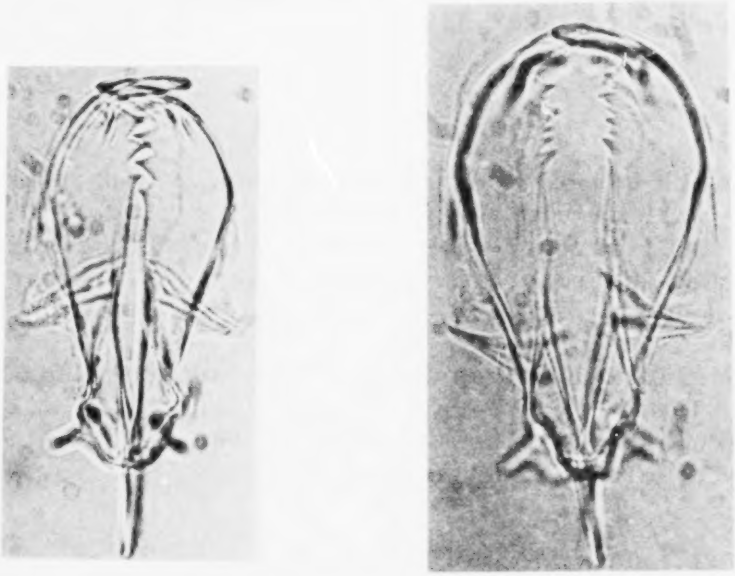
Plate 5. *Asplanchna* species.



A. priodonta, bearing young


RAMUS
UNCUS
ALULA
FULCRUM

A. priodonta trophi
(original drawing)



A. priodonta trophi and variation in dentition

Plate 6. *Asplanchna priodonta*

GENUS *BRACHIONUS* PALLAS 1766 (malleate trophi)

Brachionus is a littoral genus which often occurs in the limnetic environment, particularly during algal blooms. Species are present in the plankton from April through October and predominate at river outfalls, eutrophic near shore areas and shallow areas rich in aquatic macrophytes. Twelve species have been reported in the Great Lakes (Appendix A). However, the record of *B. diversicornis* is doubtful and may have been confused with *B. havanaensis* (Ahlstrom, 1940). All species in the genus appear useful as indicators of eutrophy. *Brachionus angularis, B. calyciflorus* and *B. quadridentatus* are among the most frequently encountered species.

Brachionus calyciflorus reproduces in culture when fed the alga *Euglena gracilis* and the yeast *Rhodotorula glutinis* (Gilbert, 1970). Pourriot (1965*a*, 1977) reported *Chlorella pyrenoidosa* and bacteria as important food items for the species. He also considers *B. angularis* a detritovore.

Additional references: Ahlstrom, 1940; Gilbert, 1967; Green and Lan, 1974; Bricker, Bricker, and Gannon, 1976; and Gilbert and Starkweather, 1977.

Key to Species

1 Six well developed anterior spines 2
Four well developed anterior spines 7
Two small anteromedian spines; anterointermediate and anterolateral spines absent or highly reduced 9

2(1) Anterolateral spines longer than anteromedian spines 3
Anterolateral spines shorter or equal in length to anteromedian spines 4

3(2) Anterointermediate spines present but not developed; LL 135-350 µm; lorica width (LW) 73-118 µm; posterolateral spines (PLS) 26-172 µm; anterolateral spines (ALS) 25-60 µm; anterointermediate spines (AIS) 2-5 µm; anteromedian spines (AMS) 15-25 µm; distance between anterolateral spines (DALS) 47-108 µm: *B. havanaensis*

Anterointermediate spines well developed; LL 175-578 µm; LW 115-265 µm; PLS 42-238 µm; ALS 16-97 µm; AIS 7-23 µm; AMS 10-34 µm; DALS 88-170 µm: *B. bidentata*

4(2) Anteromedian spines notably longer than anterolateral spines 5

Anteromedian spines about equal in length to anterolateral spines 6

5(4) Anterolateral spines longer than anterointermediate spines; anteromedian and anterolateral spines diverge laterally; two posterior spines usually present; lorica stippled, giving pustulate appearance; LL 188-418 µm; LW 134-234 µm; PLS 20-156 µm; ALS 17-49 µm; AIS 9-22 µm; AMS 21-72 µm; DALS 98-200 µm: *B. quadridentatus*

Anterolateral spines about equal in length to anterointermediate spines; anteromedian spines not strongly divergent; small truncated protuberance lies over foot opening; stout posterior spines may be present; rare; LL 268-376 µm; LW 182-250 µm; PLS 50-90 µm; ALS 19-30 µm; AIS 18-22 µm; AMS 38-52 µm; DALS 130-142 µm: *B. variabilis*

6(4) Juncture between anteromedian and anterointermediate spines acutely notched; posterior spines absent; LL 154-274 µm; LW 120-196 µm; ALS 11-17 µm; AIS 9-20 µm; AMS 18-34 µm; DALS 96-142 µm: *B. rubens*

Juncture between anteromedian and anterointermediate spines gently curved; posterior spines absent; LL 185-280 µm; LW 135-225 µm; ALS 8-26 µm; AIS 10-20 µm; AMS 14-32 µm; DALS 98-162 µm: *B. urceolaris*

7(1) Anterolateral spines longer than anteromedian spines; usually two posterior spines present; anterointermediate spines present but reduced; rare; LL 135-350 µm; LW 73-118 µm; PLS 26-172 µm; ALS 25-60 µm; AIS 2-5 µm; AMS 15-25 µm; DALS 47-108 µm: *B. havanaensis*

Anterolateral spines shorter or equal in length to anteromedian spines 8

8(7) Anteromedian spines with broad base, and longer than anterolateral spines; posterior spines often present; lorica smooth and transparent and appears as one piece; LL 180-570 µm; LW 124-300 µm; PLS 0-115 µm; ALS 15-95 µm; AMS 25-200 µm: *B. calyciflorus*

Anteromedian spines about equal in length to anterolateral spines; anterolateral spines slightly divergent; posterior spines lacking; dorsal and ventral plates evident; lorica often densely covered with spinules (tubercules); LL 115-170 µm; LW 70-105 µm; ALS 15-42 µm; AMS 23-56 µm: *B. budapestinensis*

9(1) Two divergent posterior spines present; LL 136-265 µm; LW 95-130 µm; PLS 32-128 µm; DALS 71-88 µm: *B. caudatus**

Posterior spines absent; LL 91-202 µm; LW 71-150 µm; DALS 54-93 µm: *B. angularis*

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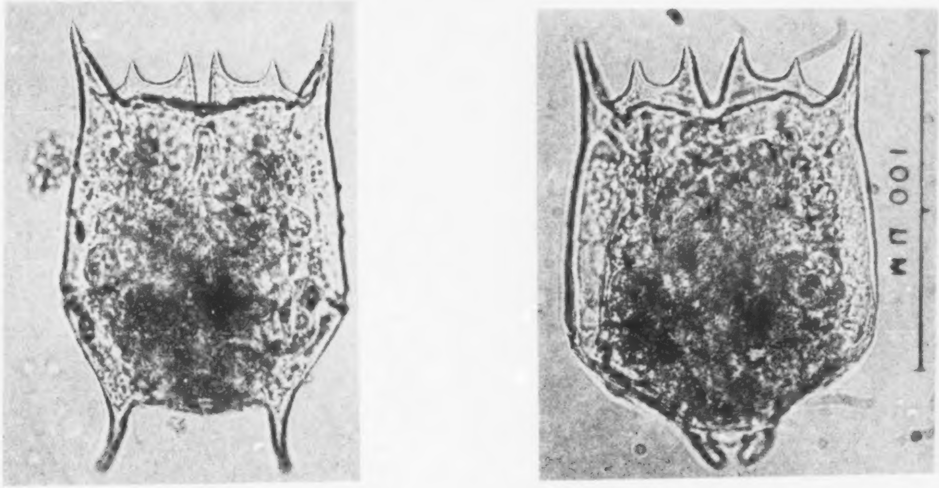
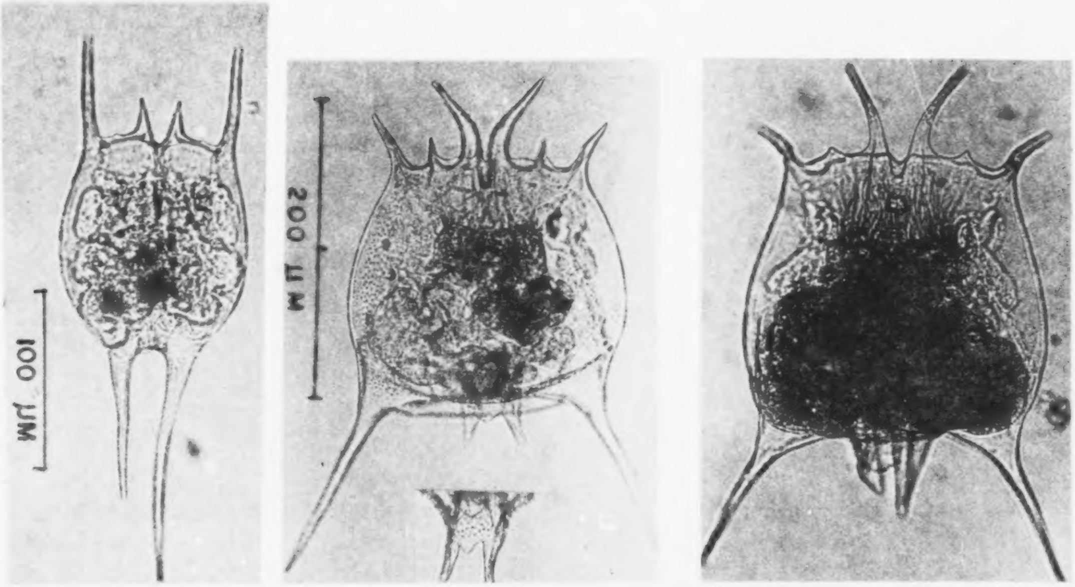
*Includes only forms *vulgatus* and *apsteini*. This species also has forms with four or six well developed anterodorsal spines but they have not been reported for the Laurentian Great Lakes.

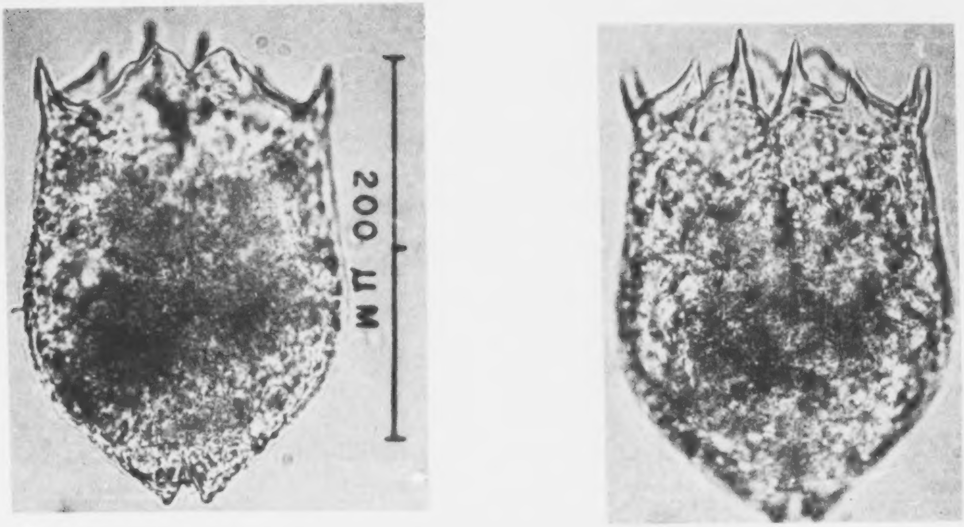


B. bidentata *B. bidentata*


100 µM
200 µM

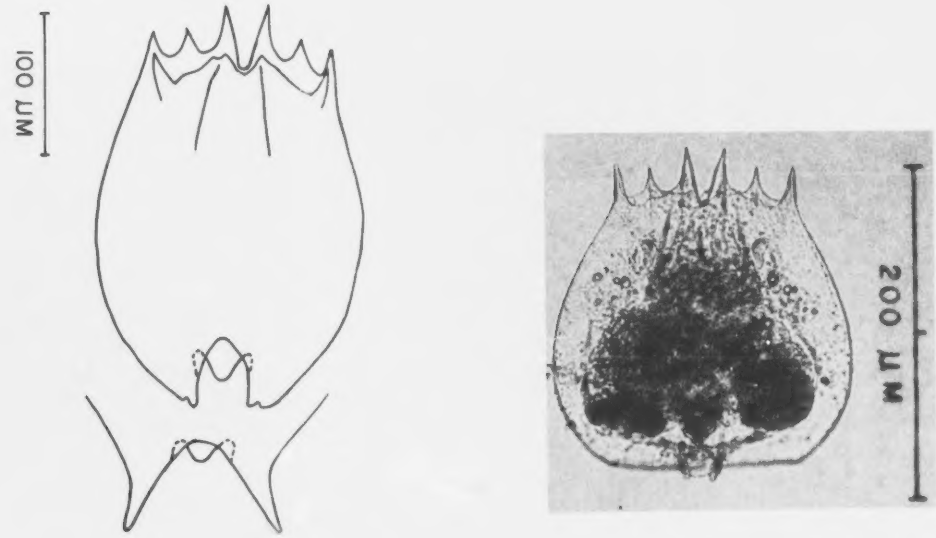
B. havanaensis *B. quadridentatus* *B. quadridentatus*

Plate 7. *Brachionus* species.



B. rubens, ventral view

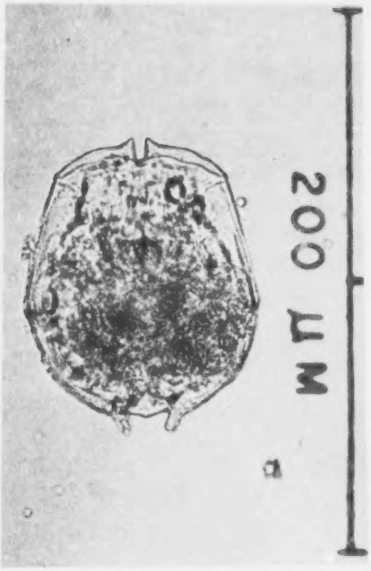
B. rubens, dorsal view


100 µM
200 µM

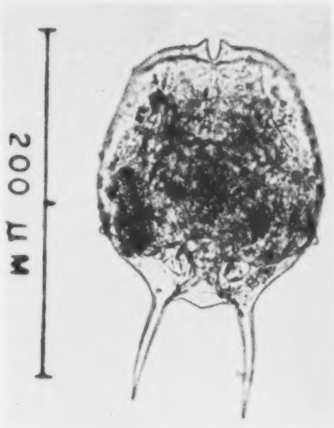
B. variabilis (redrawn from Ahlstrom, 1940)

B. urceolaris

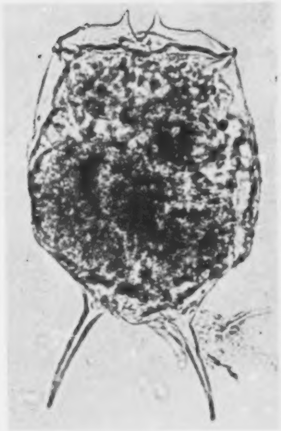
Plate 8. *Brachionus* species.



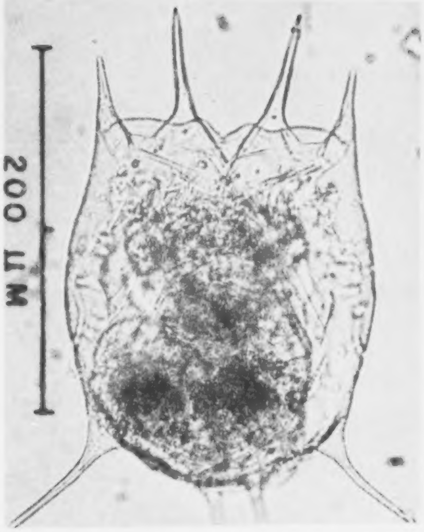
B. angularis



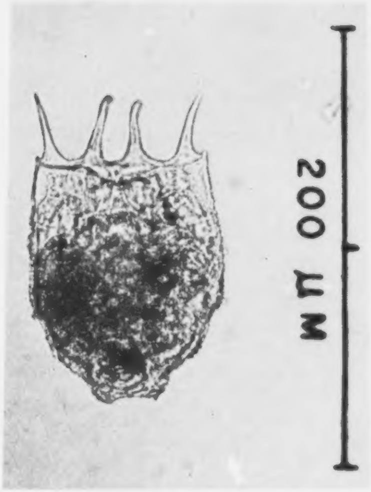
B. caudatus



B. caudatus



B. calyciflorus



B. budapestinensis

Plate 9. *Brachionus* species.

GENUS *CEPHALODELLA* BORY DE ST. VINCENT 1826 (virgate trophi)

Ten *Cephalodella* species have been reported from the littoral areas of Lakes Erie and St. Clair (Appendix A). The most common species, *Cephalodella gibba*, has also been observed in Lakes Huron and Michigan (Stemberger, unpublished). The species appear sporadically in the plankton even though they are epiphytic and benthic. The species are easily distinguished from other genera in the family Notommatidae by the long thin virgate trophi. The stiffness of the lorica in the genus varies considerably among different species. In some species a membranous lateral fissure separating the lorica is sometimes evident.

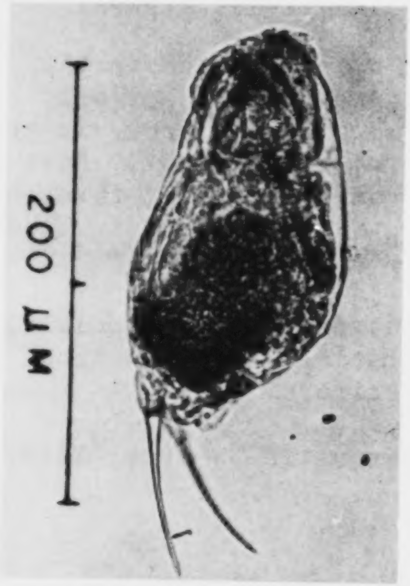
Cephalodella gibba is an omnivore which feeds on other rotifers, green algae and diatoms (Wulfert, 1937; Pourriot, 1965*a*).

Additional references: Harring and Myers, 1924; Myers, 1934*a*; Wulfert, 1938; and Koste, 1976.

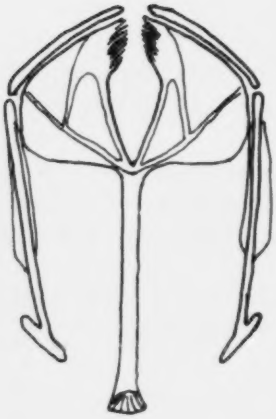
Most Frequently Reported Species

Cephalodella gibba: total length (TL) 250-300 µm; toes 70-80 µm.

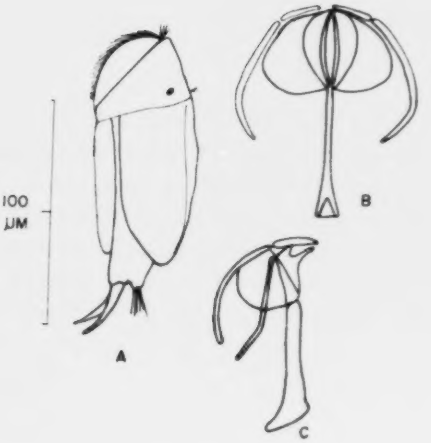
Cephalodella auriculata: TL 120-140 µm; toes 22-25 µm.



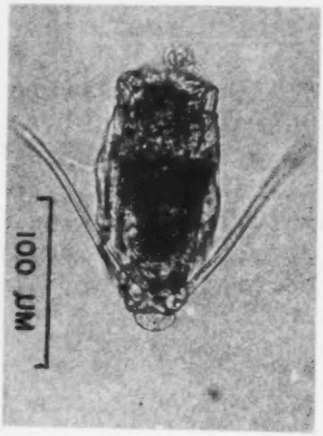
C. gibba



C. gibba trophi (redrawn from Wulfert, 1937)



C. auriculata; *A*, lateral view; *B*, trophi, ventral view; *C*, trophi, lateral view (redrawn from Wulfert, 1937)



C. intuta, ventral view

Plate 10. *Cephalodella* species.

GENUS *COLLOTHECA* HARRING 1913 (uncinate trophi)

Eight *Collotheca* species have been reported in the littoral areas of the Great Lakes (Appendix A) but only *Collotheca mutabilis* and *C. pelagica* commonly occur in the plankton. *Collotheca mutabilis* is most prevalent. Both species co-occur in the plankton from late spring through November. Maximum abundance for *C. mutabilis* occurs from late summer through early fall.

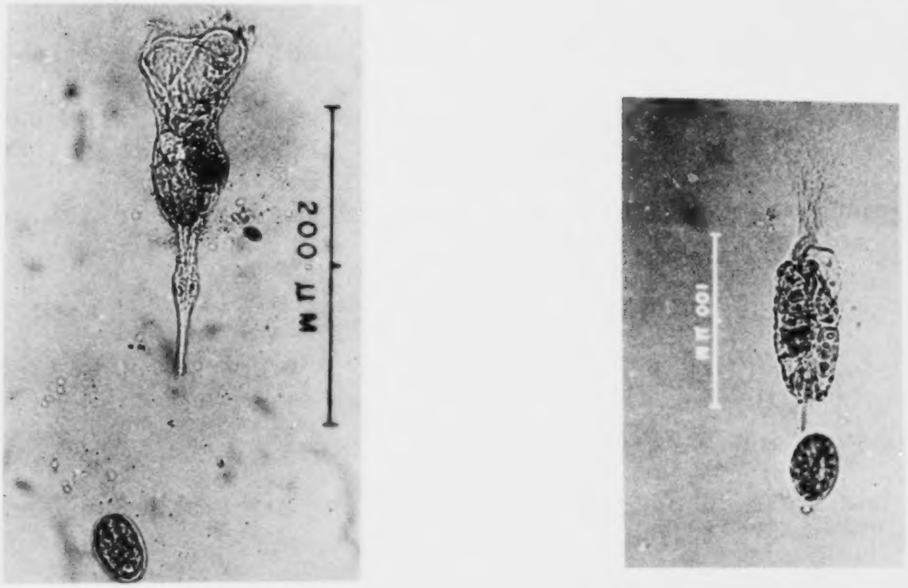
Members of the Order Collothecaceae have a specialized funnel-like corona studded with bristles which functions to trap prey such as protozoans and rotifers.

Additional references: Edmondson, 1939, 1940, 1944, 1945; and Berzins, 1951.

Pelagic Species

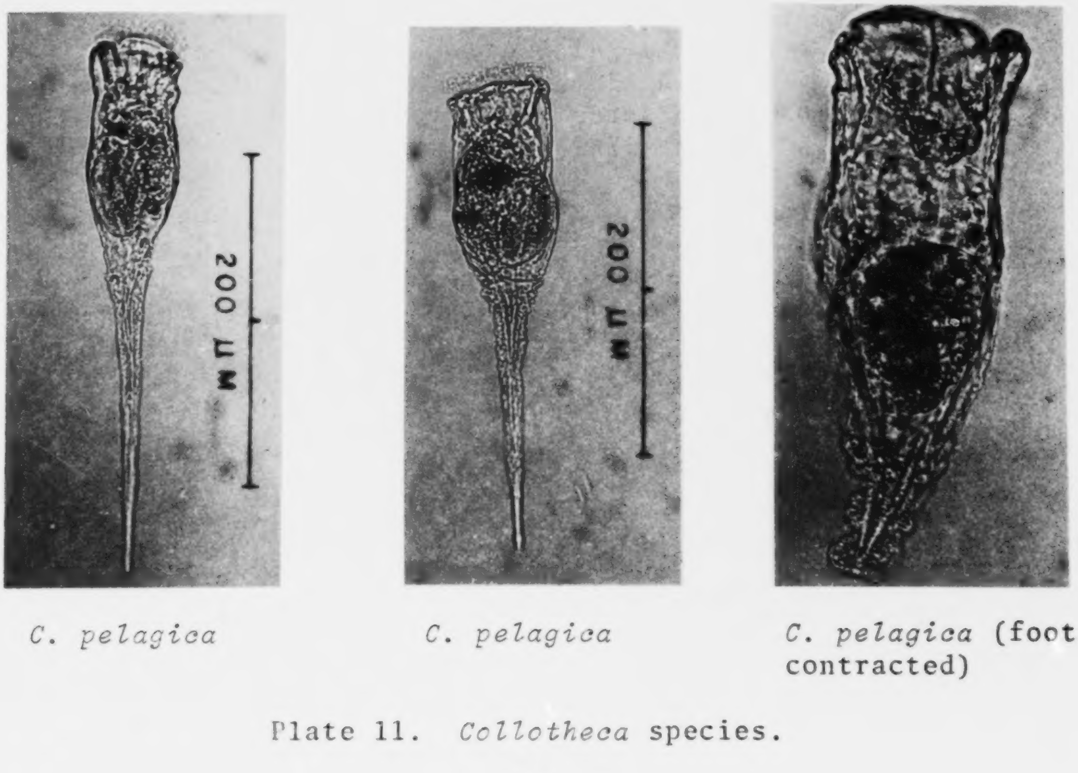
Collotheca mutabilis: corona with two lobes; foot with swelling near distal end; two eyespots on dorsal coronal lobe; body surrounded by gelatinous sheath; contracted specimens small (length 120 µm) with foot retracted against body and long hairlike setae emerging from anterior end; TL (of extended specimens) 178-315 µm.

Collotheca pelagica: corona without lobes and circular in appearance; foot long and without swelling at distal end; without eyespots; head region often with annular appearance; coronal cilia short; body surrounded by elongated gelatinous sheath (often not visible); contracted specimens small with foot retracted against body and usually without cilia emerging from coronal region; TL (of extended specimens) 275-400 µm.


200 µm
100 µm

C. mutabilis within gelatinous hull

C. mutabilis (contracted), with egg


200 µm
200 µm

C. pelagica

C. pelagica

C. pelagica (foot contracted)

Plate 11. *Collotheca* species.

GENUS *COLURELLA* BORY DE ST. VINCENT 1824 (malleate trophi)

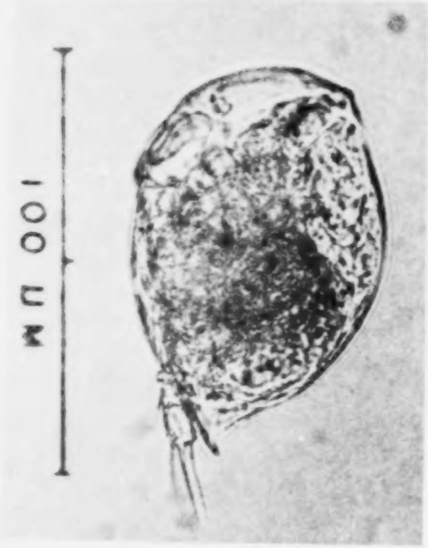
Three species and two forms of the genus *Colurella* have been reported from littoral areas of the Great Lakes (Appendix A), but are uncommon. Lorica are well developed. Members of the genus are morphologically variable and identification to species is often difficult.

References: Hauer, 1924; Ahlstrom, 1938; and Carlin, 1939.

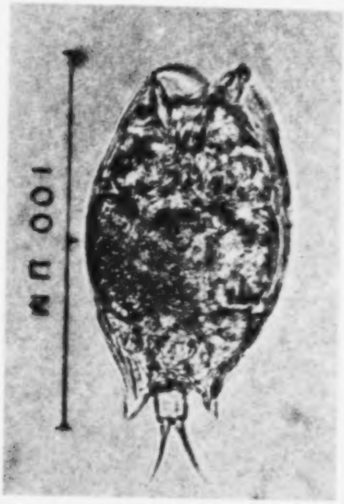
Representative Species

Colurella uncinata: LL 77-100 μm; lorica depth (LD) 55 μm; toes 13-14 μm.

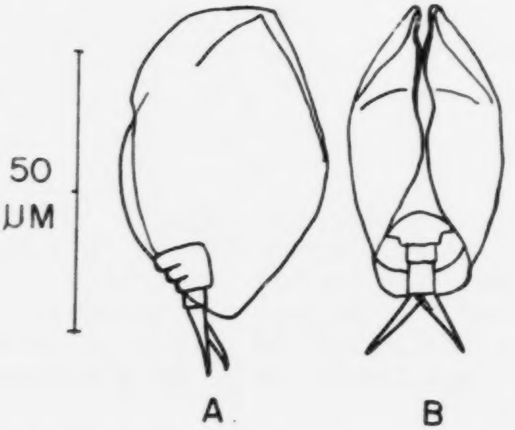
Colurella obtusa: LL 65 μm; LW 34 μm; LD 42 μm; toes 18 μm.



C. uncinata, lateral view



C. uncinata, dorsal view



C. obtusa; *A*, lateral view; *B*, ventral view
(redrawn from Voigt, 1957)

Plate 12. *Colurella* species.

GENUS *CONOCHILOIDES* HLAVA 1904 (malleoramate trophi)

Of the two *Conochiloides* species treated in this guide, only *C. dossuarius* has been reported for the Great Lakes (Appendix A). *Conochiloides dossuarius* is morphologically similar to *Conochilus* but differs in the length and position of the lateral antennae. European workers have incorporated *Conochiloides* in the genus *Conochilus* (Ruttner-Kolisko, 1974; Walter Koste, personal communication). Only those species which form colonies (*Conochilus*) have antennae located anteriorly. In species which are solitary (*Conochiloides*), the antennae are located laterally. However, since the reasons for eliminating the genus *Conochiloides* are not entirely conclusive, the genera are treated separately in the guide. *Conochiloides dossuarius* commonly occurs during summer months in shallow areas and river mouths and is a consistent indicator of eutrophy in the Great Lakes (Stemberger et al., 1979; Gannon and Stemberger, 1978).

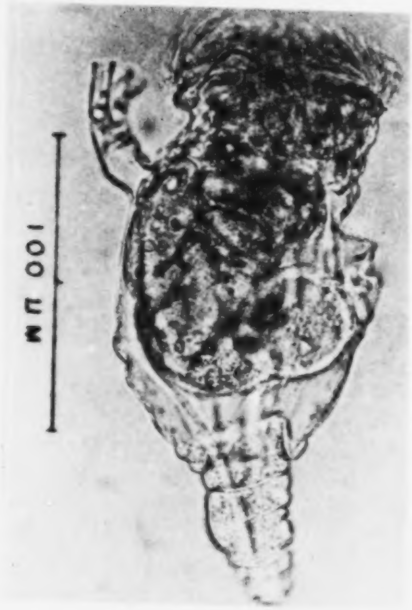
Conochiloides natans, a cold stenotherm, occurs in deep inland lakes of northern lower Michigan during winter and early spring (Gannon and Stemberger, 1978). The species feeds on chrysomonads and centric diatoms (Pourriot, 1977).

Additional references: Ahlstrom, 1938; Edmondson, 1959; Pourriot, 1965*b*; and Donner and Adeniji, 1977.

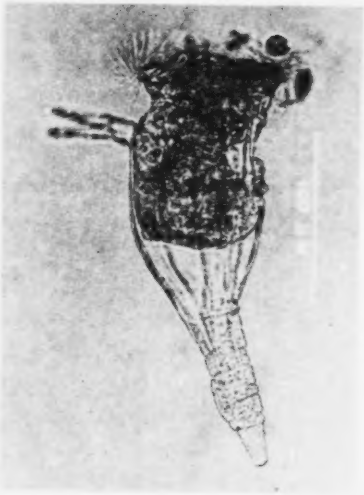
Representative Species

Conochiloides dossuarius: lateral antennae fused near midpoint; rami of trophi asymmetrical; left uncus with five large teeth, three of which are fused near base; right uncus with five large unfused teeth; body enclosed in thin gelatinous sheath (often absent or not visible in fixed specimens); warm stenotherm; TL (foot extended) 250-500 μm.

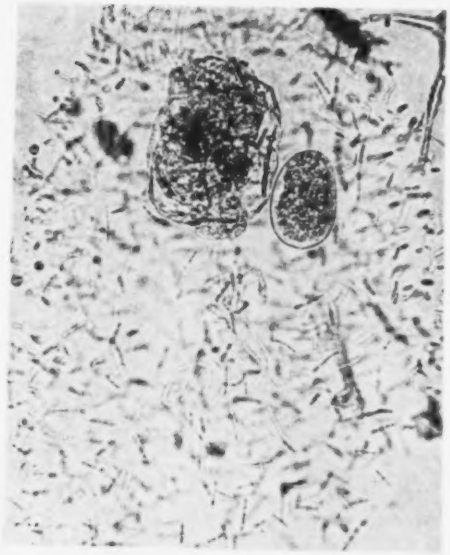
Conochiloides natans: lateral antennae long and separate; foot broad-based and corpulent; rami symmetrical; right and left unci each with five large unfused teeth; body enclosed in gelatinous sheath; cold stenotherm; TL 280-520 μm.



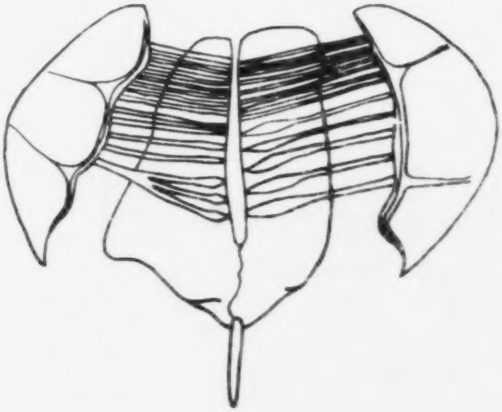
C. dossuarius



C. dossuarius

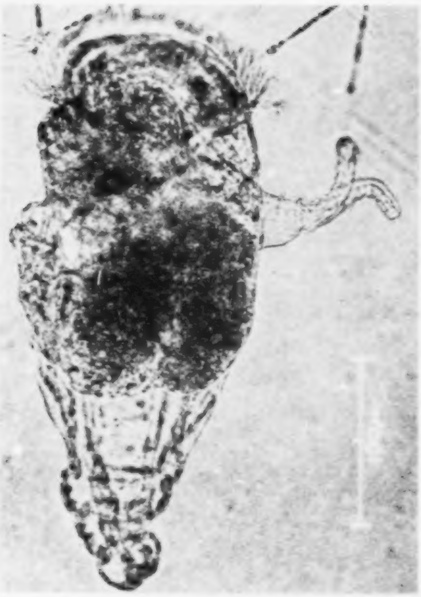


C. dossuarius, contracted within gelatinous hull (algae in gelatinous matrix)

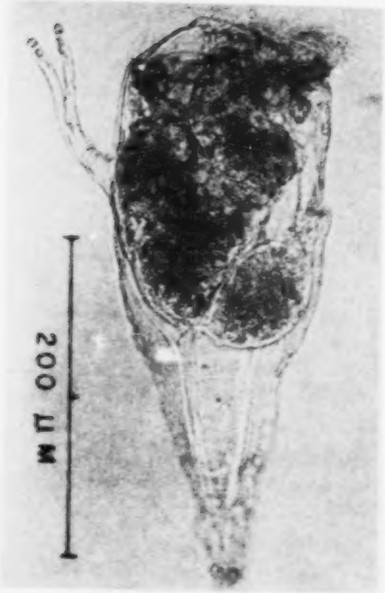


C. dossuarius trophi (redrawn from Ahlstrom, 1938)

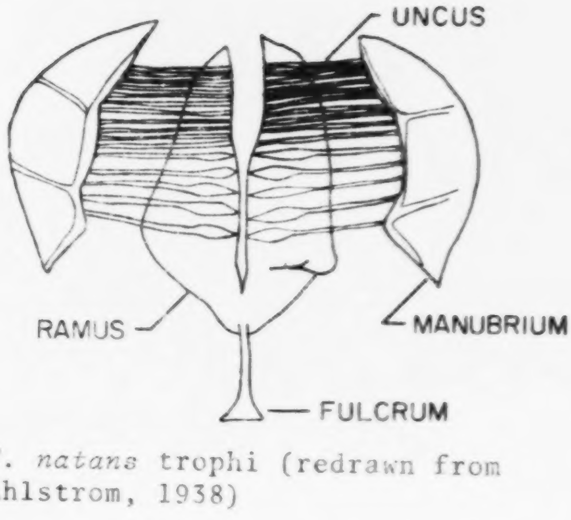
Plate 13. *Conochiloides dossuarius*



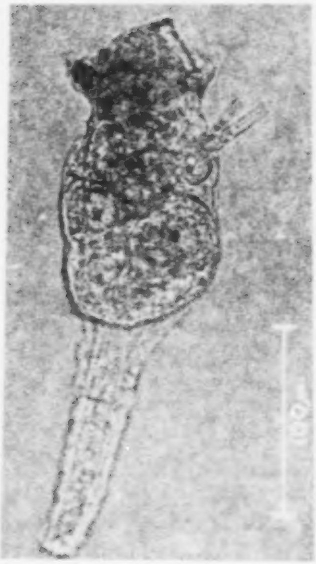
C. natans



C. natans


UNCUS
RAMUS
MANUBRIUM
FULCRUM

C. natans trophi (redrawn from Ahlstrom, 1938)



Conochiloides sp.

Plate 14. *Conochiloides* species.

GENUS *CONOCHILUS* EHRENBERG 1834 (malleoramate trophi)

Conochilus unicornis, an important limnetic species, displays peak abundance during summer and may be present from June through January in the Great Lakes. In Douglas Lake, Michigan, the species was present throughout the year (Fuller, Stemberger and Gannon, 1977). The species may occur in colonies or as single individuals.

In the Great Lakes forms of *C. unicornis* the dorsal antennae located on the apical field are fused for most of their length. Pejler (1956) has shown that the degree of fusion of the antennae varies from complete separation to complete fusion in populations of the species from Swedish lakes. Pejler (1956) also reported intermediate forms between *C. unicornis* and *C. hippocrepis*.

Conochilus hippocrepis has been reported from littoral areas of the Great Lakes and is a rare species in the limnetic plankton of inland lakes of northern Michigan. The antennae are of unequal length, completely separated, and longer than in *C. unicornis*. The body and foot are also larger and the species may occur in large colonies. However, most specimens observed in Michigan lakes occurred as solitary individuals (Stemberger, unpublished).

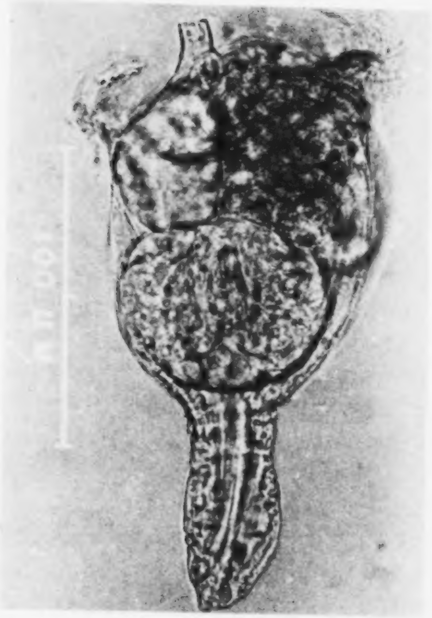
Pourriot (1977) reported that both *C. unicornis* and *C. hippocrepis* feed on detritus and bacteria.

Additional references: Ruttner-Kolisko, 1974, 1977.

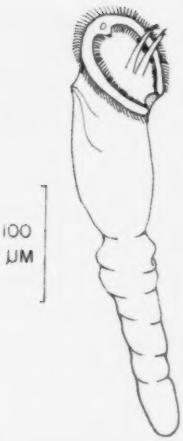
Only Known Species

Conochilus unicornis: with two short lateral antennae on apical field partially fused; foot often retracted against body; may form spherical colonies of 5-12 individuals encased in gelatinous sheath; TL (for extended specimens) 200-450 µm.

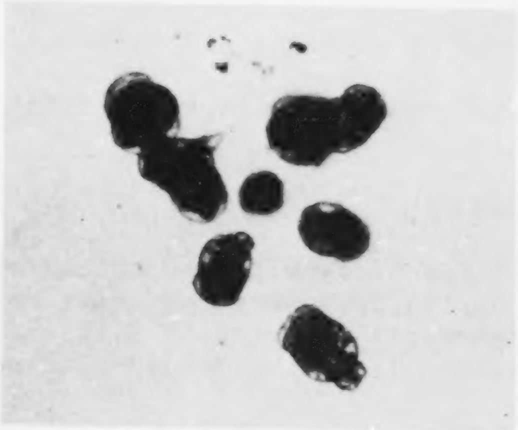
Conochilus hippocrepis: with two separate lateral antennae located on apical field; two distinctly separate eye-spots near base of corona; foot often retracted against body; may form colonies containing 30-60 individuals encased in a gelatinous sheath; TL (for extended specimens) 400-800 µm.



C. unicornis



C. hippocrepis (original drawing).



C. unicornis colony

Plate 15. *Conochilus* species.

GENUS *DICRANOPHORUS* NITZCH 1827 (forcipate trophi)

Five *Dicranophorus* species have been reported in littoral and psammon environments of the Great Lakes (Appendix A).

Many members of the family Dicranophoridae are predaceous. The forcipate trophi can be thrust from the mastax to capture prey. Myers (1941) reported that the diet of *Dicranophorus forcipatus* includes bdelloid rotifers, *Cephalodella* and *Trichocerca*.

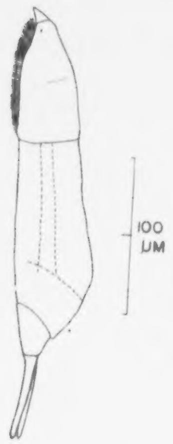
Additional references: Harring and Myers, 1927; Neal, 1958; and Koste, 1976.

Representative Species

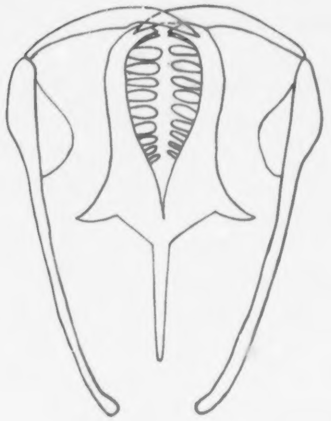
Dicranophorus caudatus: TL 260 µm; toes 70 µm; trophi 35 µm.

Dicranophorus forcipatus: TL 300 µm; toes 50 µm; trophi 50 µm.

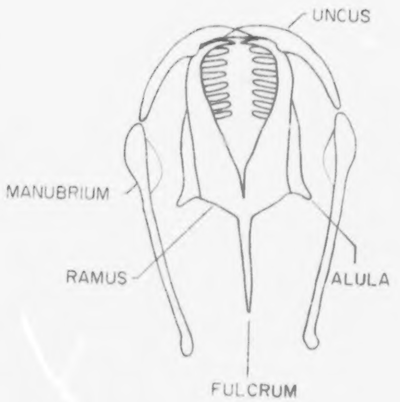
Dicranophorus mesotis: TL 280 µm; toes 55 µm; trophi 40 µm.



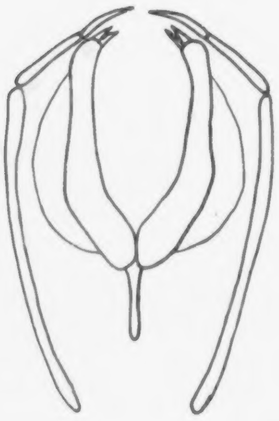
D. mesotis (redrawn from Harring and Myers, 1927)



D. mesotis trophi (redrawn from Harring and Myers, 1927)


UNCUS
MANUBRIUM
RAMUS
ALULA
FULCRUM

D. forcipatus trophi (redrawn from Harring and Myers, 1927)



D. caudatus trophi (redrawn from Harring and Myers, 1927)

Plate 16. *Dicranophorus* species.

GENUS *ENCENTRUM* EHRENBERG 1838 (forcipate trophi)

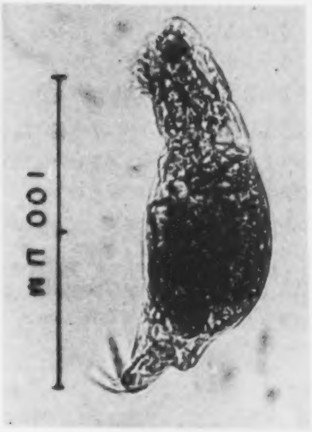
Encentrum is an uncommon genus of littoral areas which may become locally abundant. Only two species, *Encentrum saundersiae* and *E. felis*, have been reported for western Lake Erie and Lake St. Clair, although an undetermined species occurred in Lake Michigan at inshore areas (Stemberger, unpublished). Some species are predaceous (Wulfert, 1956*a*). Trophi with a round or elongated piece between the manubrium and uncus are characteristic of the genus. The psammolittoral rotifer *Wierzejkiella* has similar mouthparts but differs in its longer foot.

Additional references: Harring and Myers, 1927; Myers, 1933*b*; Wulfert, 1936; Sudzuki, 1964; and Koste, 1976.

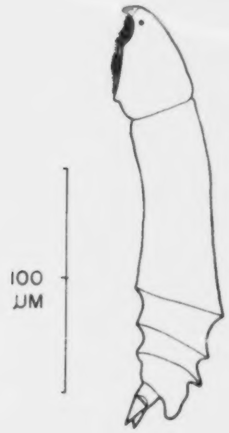
Representative Species

Encentrum felis: TL 135 μm; toes 15 μm; trophi 15-18 μm.

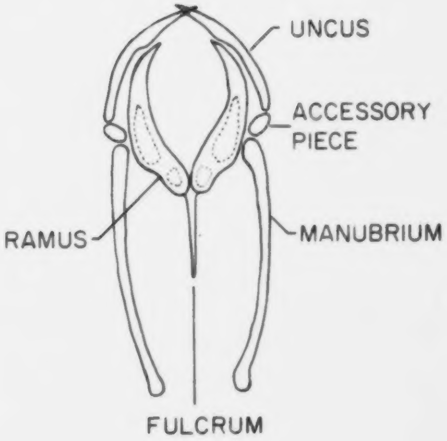
Encentrum saundersiae: TL 165-350 μm; toes 14-18 μm; trophi 30-35 μm.



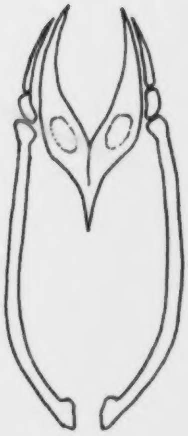
Encentrum sp.



E. saundersiae (redrawn from Harring and Myers, 1927)


UNCUS
ACCESSORY PIECE
RAMUS
MANUBRIUM
FULCRUM

E. saundersiae trophi (redrawn from Harring and Myers, 1927)



E. felis (redrawn from Harring and Myers, 1927)

Plate 17. *Encentrum* species.

GENUS *EUCHLANIS* EHRENBERG 1832 (malleate trophi)

Some members of the littoral genus *Euchlanis* occasionally occur in the limnetic nearshore environment. *Euchlanis dilatata* and *E. triquetra* are the most common of the 11 Great Lakes species reported (Appendix A). Members of the genus are usually present from May through November at river outfalls, harbors and shallow littoral areas. *Euchlanis dilatata* most frequently occurs in eutrophic Great Lakes environments. Voigt (1904) observed *E. dilatata* living attached to colonies of *Gloetrichia echinulata* during a bloom.

Pourriot (1977) and Thane-Fenchel (1968) reported bacteria, green algae and diatoms as part of *E. dilatata's* diet. Edmondson (1965) and King (1972) cultured *E. dilatata* on *Chlorella* and *Chlamydomonas reinhardti*, respectively.

Photomicrographs of *Dipleuchlanis propatula* and the rare pond species *Manfredium eudactylotum* are included on Plate 20 as representatives of related genera.

Additional reference: Myers, 1930.

Key to Species

1 Dorsal plate with deep posterior u-shaped notch 2
Dorsal plate with posterior v-shaped notch 4
Dorsal plate without distinctive posterior notch ... 5

2(1) Anterodorsal margin straight or concave; dorsal plate length (DPL) 120-140 µm; dorsal plate width (DPW) 80-100 µm; ventral plate length (VPL) 100-120 µm; ventral plate width (VPW) 50-65 µm; posterior notch depth (PND) 35-45 µm; toes 65-75 µm: *E. meneta*
Anterodorsal margin distinctly notched or indented 3

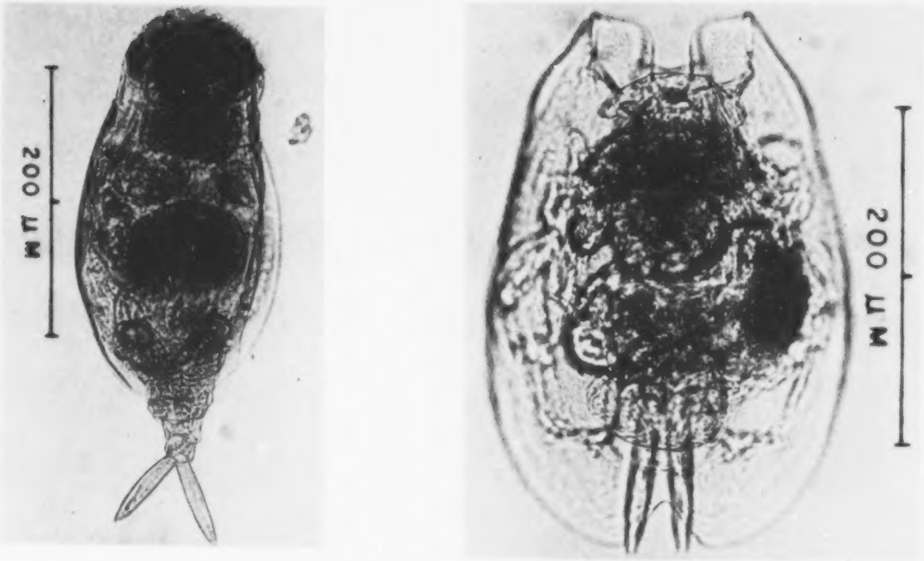
3(2) Anterodorsal margin with semicircular notch; DPL 200-270 µm; DPW 90-189 µm; VPL 170-250 µm; VPW 80-105 µm; LD 90-155 µm; toes 50-75 µm: *E. dilatata*
Anterodorsal margin with rectangular notch; long slender toes; DPL 140 µm; DPW 100 µm; VPL 125 µm; VPW 75 µm; PND 50 µm; toes 70 µm: *E. parva*

4(1) Prominent dorsal keel present; body circular in appearance; toes long and slender; ventral plate well developed; triradiate in cross-sectional view; DPL 210-270 µm; DPW 155-240 µm; VPL 180-240 µm; VPW 105-160 µm; LD 140-180 µm; toes 70-85 µm: *E. triquetra*

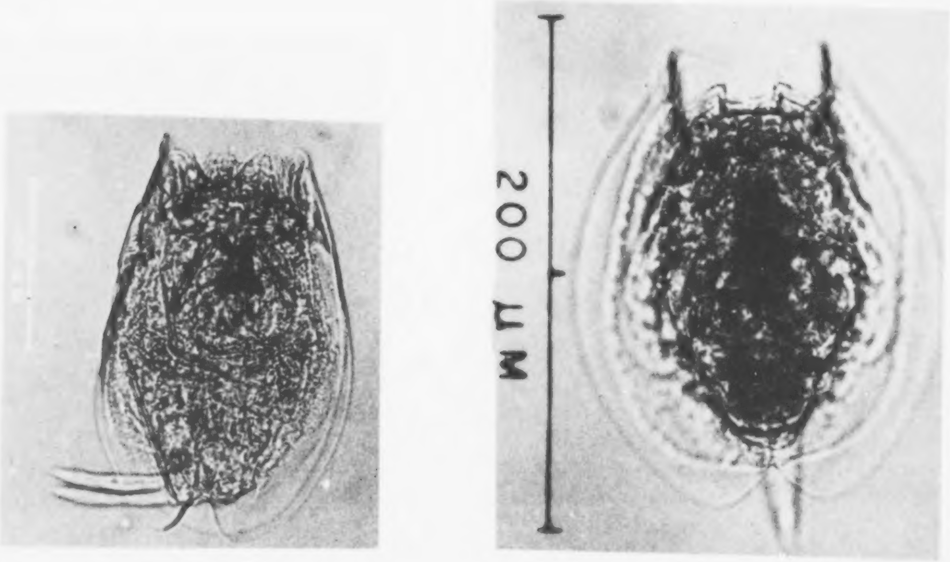
Dorsal keel not present; dorsal plate dome-shaped; ventral plate not developed and lateral sulci absent; DPL 280 µm; DPW 220 µm; toes 120 µm: *E. calpidia*

5(1) Dorsal plate forms distinct keel; toes long and slender, slightly enlarged posteriorly, but pointed distally; body rounded and triradiate in cross-sectional view; DPL 300-500 µm; DPW 270-450 µm; toes 90-150 µm: *E. pellucida*

Dorsal plate rounded; ventral plate elongated about half the width of dorsal plate; toes stout; DPL 260-280 µm; DPW 185-210 µm; VPL 200-220 µm; VPW 150-170 µm; toes 70-100 µm: *E. alata*

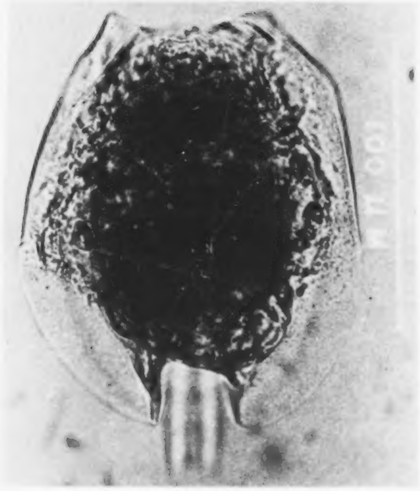

200 µm
200 µm

E. alata *E. calpidia*

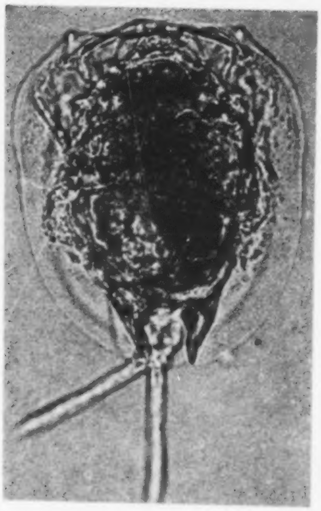


E. dilatata *E. parva*

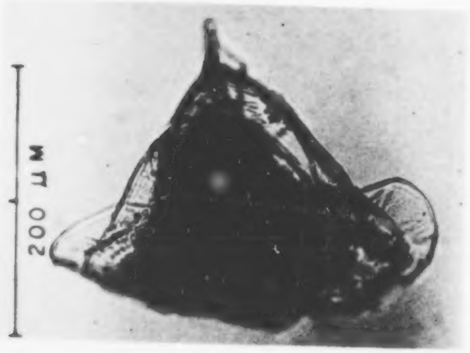
Plate 18. *Euchlanis* species.



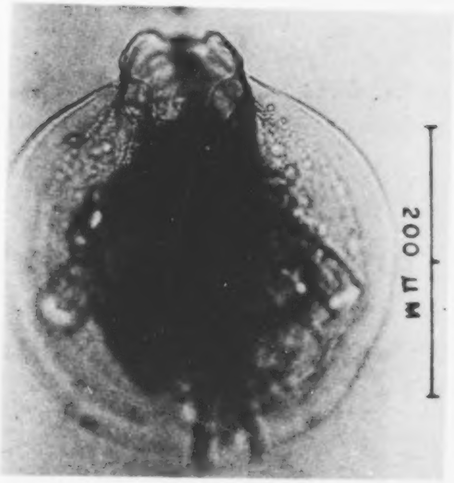
E. meneta



E. meneta

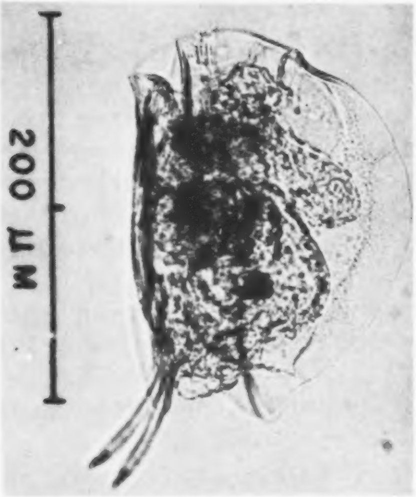


E. pellucida, cross-sectional view

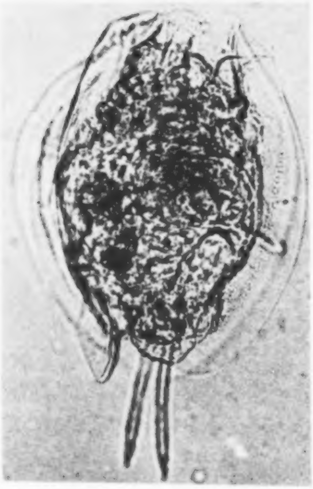


E. pellucida, anterior margin

Plate 19. *Euchlanis* species.

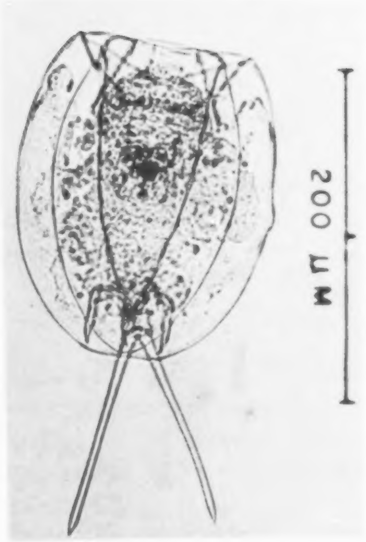


E. triquetra, lateral view

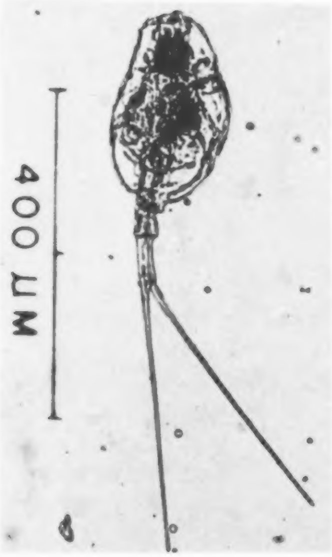


E. triquetra, dorsolateral view

Additional Species



Dipleuchlanis propatula,
related genus



Manfredium eudactylotum,
related genus

Plate 20. *Euchlanis* species.

GENUS *FILINIA* BORY DE ST. VINCENT 1824 (malleoramate trophi)

Three *Filinia* species occur in the Great Lakes. The two major species, *F. longiseta* and *F. terminalis*, represent the terminal morphotypes of a complex of forms which display intermediate characteristics between the two extremes. Although the intermediate forms have not been reported for the Great Lakes, they occur in the inland lakes of northern lower Michigan (TABLE 1). *Filinia longiseta* is considered a warm stenotherm but can also occur during cold water temperatures. *Filinia terminalis* occurs primarily in the winter and spring. It may also co-occur with *F. longiseta* in late spring (Stemberger et al., 1979). *Filinia brachiata* occurs from spring through fall but has been reported only in harbors and rivers flowing to the Great Lakes (Prins and Davis, 1966; Stemberger, 1974). *Filinia brachiata* and *F. longiseta* show promise as indicators of eutrophy (Gannon and Stemberger, 1978).

Pourriot (1977) reports detritus, bacteria and *Chlorococcales* in the diet of *F. longiseta*.

Additional references: Parise, 1961; Hutchinson, 1964; and Hofmann, 1974.

Key to Species

1 Spinelike bristles about same length or shorter than body and thickened at base; corona developed into liplike structure; BL 95-190 μm: *F. brachiata*

Bristles much longer than body and not notably thickened at base 2

2(1) Ratio of lateral bristle to caudal bristle >1.8; distance of insertion of caudal bristle to posterior extremity >20 μm; Great Lakes forms have spinelets on bristles in summer; lateral bristle 450-560 μm; caudal bristle 240-310 μm: *F. longiseta**

Ratio of lateral bristle to caudal bristle <1.6; distance of insertion of caudal bristle to posterior extremity <15 μm; lateral bristle 315-515 μm; caudal bristle 220-390 μm; cold stenotherm: *F. terminalis**

---

*Measurements from Lake Huron specimens.

TABLE 1. COMPARISON OF DIFFERENT *FILINIA* POPULATIONS TO RELEVANT TAXONOMIC CRITERIA[a]

	F. longiseta "Typical"	Intermediate Forms						*F. terminalis* "Typical"
L/C[b]	1.9	2.7	1.6	1.5	1.4	1.3	1.3	1.3
SD	0.1	0.19	0.09	0.05	0.05	0.06	0.05	0.06
D[c]	31.7	8.9	32.7	37.4	1.0	9.5	1.0	1.0
SD	4.9	1.1	5.1	2.9	1.3	3.2	0.04	0.9
Bristle Setation	yes	no	no	no	yes	yes	no	no
N[d]	14	15	14	9	16	17	15	15
Season	summer	summer	winter	winter	spring	all	winter	winter
Temp. (C) at 1 m	21.0	22.5	3.0	2.5	9.8	1.5-24.0	3.0	1.6
Lake	Huron	Dog	Lance	Silver	Silver	Douglas	Lance	Arnott

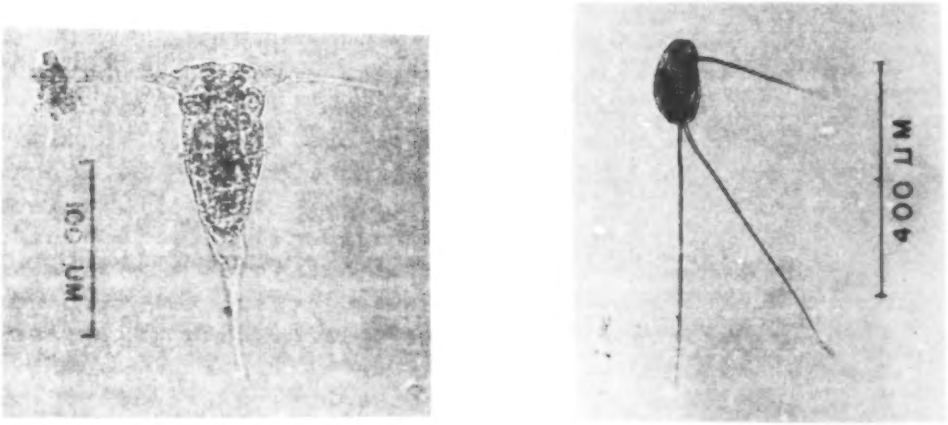
[a] Specimens collected from northern lower Michigan lakes.

[b] Ratio of lateral bristle to caudal bristle.

[c] Distance (μm) of insertion of caudal bristle to posterior extremity.

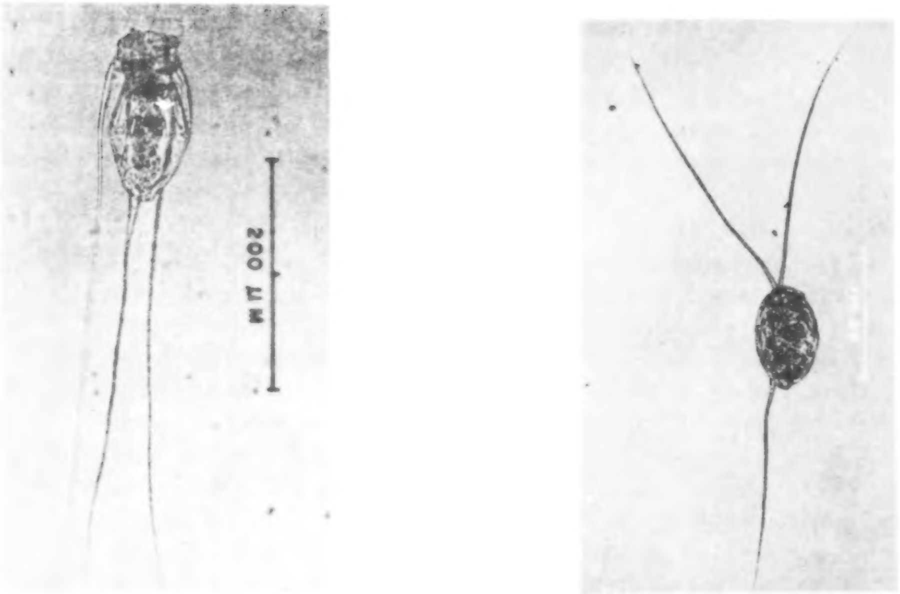
[d] Number of specimens measured.

Filinia


100 UM
400 UM

F. brachiata (corona contracted)

F. longiseta (corona contracted)



F. terminalis (corona extended)

F. terminalis (corona contracted)

Plate 21. *Filinia* species.

GENUS *GASTROPUS* IMHOF 1898 (virgate trophi)

All three known species of the genus *Gastropus* have been reported in the Great Lakes but only *Gastropus stylifer* is numerically important, occurring from spring through fall. In inland lakes the species is eurytopic and occurs throughout the year in some lakes (Fuller et al., 1977; Stemberger, unpublished). The species was rare in Lake Ontario (Nauwerck, 1972) but was an important member of the plankton of Lakes Michigan and Huron (Stemberger, 1974; Stemberger et al., 1979). *Gastropus hyptopus* is a rare littoral species of the Great Lakes plankton. In inland lakes the species maxima usually occurs in fall (Stemberger, unpublished). The only records for *Gastropus minor* were reported from the littoral area of Lake Erie by Kellicott (1897) and Jennings (1900).

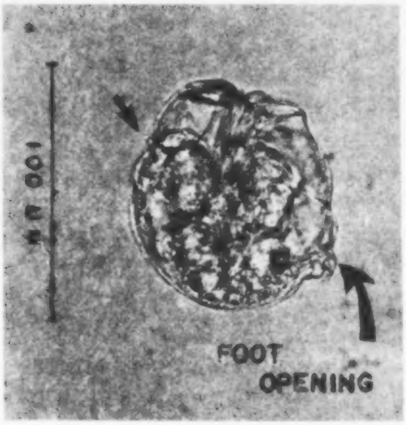
Gastropus stylifer feeds on Dinophyceae (Ruttner-Kolisko, 1974) and *G. hyptopus* was successfully cultured on *Synura* by Pourriot (1965*a*).

Additional references: Wulfert, 1939; Edmondson, 1959; and Sudzuki, 1964.

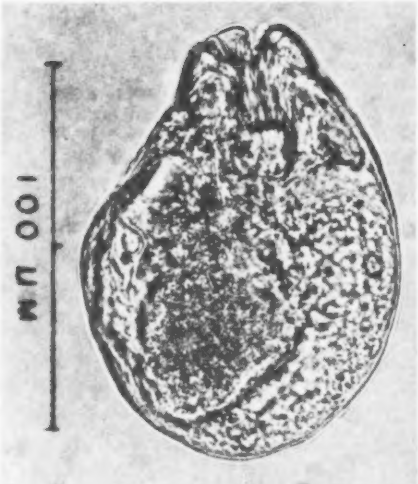
Most Likely Encountered Species

Gastropus stylifer: body laterally compressed and colored in living specimens; foot annulated with single toe, often retracted into body; small dorsal antennae prominent; anterior region of lorica narrowed and folded; LL 100-250 µm.

Gastropus hyptopus: body not strongly compressed laterally; foot smooth, with two toes, often retracted into body; eyespot prominent; small dorsal antennae prominent; opening at anterior margin of lorica wide and with folds; LL 95-360 µm.


100 um
FOOT OPENING

G. hyptopus (foot retracted), lateral view
(top arrow points to dorsal antenna)



G. stylifer (foot retracted), lateral view

Plate 22. *Gastropus* species.

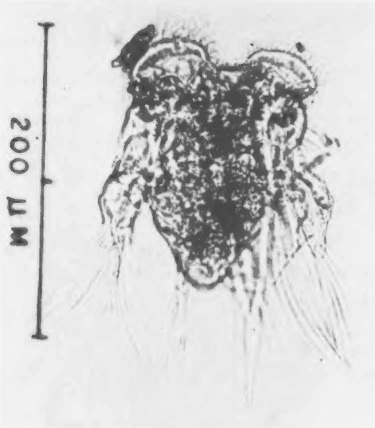
GENUS *HEXARTHRA* SCHMARDA 1854 (malleoramate trophi)

Hexarthra mira is the only species of the genus reported for the Great Lakes but Beach (1960) reported *H. intermedia* (= *Pedalia insulana*) from lakes of northeastern Michigan. *Hexarthra mira* occurs from spring through fall, with peak abundance in summer. It is common in Lake St. Clair (Bricker et al., 1976) but is not a part of the pelagic community of the other Great Lakes. Its major food source is detritus and associated bacteria (Pourriot, 1977).

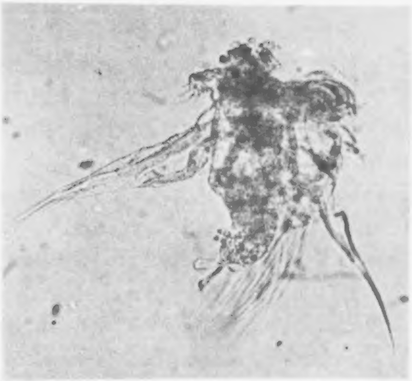
Additional references: Bartoš, 1948 and Fairchild et al., 1977.

Only Reported Species

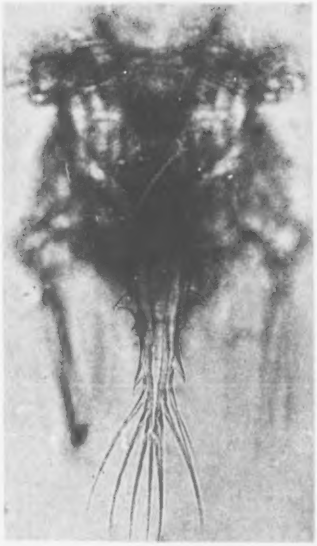
Hexarthra mira: body with six armlike appendages; uncus with six teeth; corona developed into liplike structure; large ventral appendage with eight long bristles; posterior end of body often with club-shaped appendages; BL 160-212 µm.



H. mira



H. mira, lateral view



H. mira, ventral appendage

Plate 23. *Hexarthra mira*

GENUS *KELLICOTTIA* AHLSTROM 1938 (malleate trophi)

Kellicottia longispina, a major limnetic rotifer, may be present throughout the year in the Laurentian Great Lakes. Peak abundance occurs between May and August. During thermal stratification the species is most abundant in the metalimnion (Stemberger, 1974; Stemberger et al., 1979). Probable food species include *Mallomonas*, *Dinobryon* (Pourriot, 1965*a*), *Chrysochromulina* and *Stichococcus* (Edmondson, 1965).

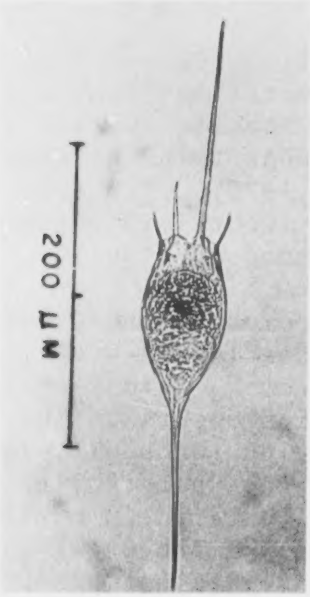
Kellicottia bostoniensis, less common in the Great Lakes, is often found in inland lakes which are low in oxygen in the lower depths. Peak abundance occurs during late summer and early fall. In inland lakes the species occurs in the hypolimnion during thermal stratification (Campbell, 1941) but may be present throughout most of the year (Fuller et al., 1977). The species is most likely encountered in nutrient-enriched embayments and at river mouths of the Great Lakes. This species may be endemic to North America but has been recently reported in Europe (Berzins, Grönberg and Melgren, 1968).

Additional references: Pejler, 1962*a* and Sudzuki, 1964.

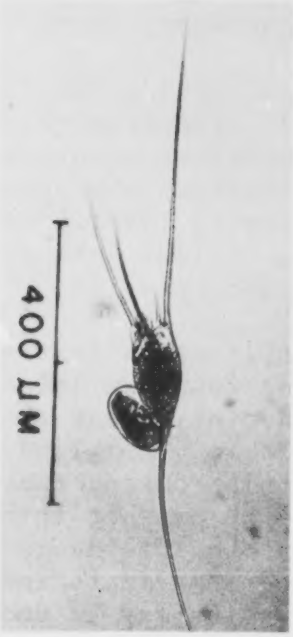
Known Species

Kellicottia longispina: anterior margin with six spines of unequal length; LL 400-860 μm; posterior spine (PS) >200 μm.

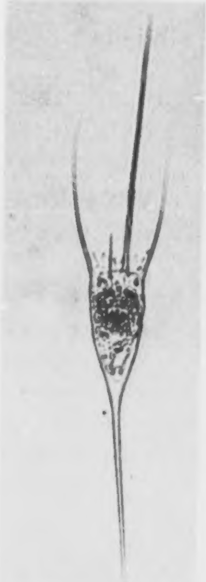
Kellicottia bostoniensis: anterior margin with four spines of unequal length; LL 360 μm; PS 122 μm.



K. bostoniensis, dorsal view



K. longispina with egg, lateral view



K. longispina, dorsal view

Plate 24. *Kellicottia* species.

GENUS *KERATELLA* BORY DE ST. VINCENT 1822 (malleate trophi)

Keratella is perhaps the most common limnetic rotifer genus of fresh water. Three or more members of the genus frequently co-occur in the Great Lakes at any given time. The polytypical species *Keratella cochlearis* is the major species of the genus. The designation of forms and varieties of the species is inconsistent in the literature and without genetic basis. Ruttner-Kolisko (1974) considers all morphs as well as some established species (*K. crassa* and *K. earlinae*) as forms of the *K. cochlearis* species complex. For the forms and varieties of *K. cochlearis* I have mainly followed Ahlstrom's (1943) revision. Thus the stem species is designated *K. cochlearis cochlearis* (Gosse). The form lacking the posterior spine is *K. cochlearis* f. *tecta*. The short-spined form *micracantha* and the long posterior-spined form *macracantha* have not been observed in the Great Lakes and are omitted from the guide. These forms comprise the "*tecta* series" of the European literature. The intermediate form *typica* of this "series" is likely synonymous with *K. cochlearis cochlearis* of Ahlstrom (1943).

Three varieties of *K. cochlearis* have been reported from the Great Lakes: *K. cochlearis* var. *hispida*, var. *robusta*, and var. *faluta*. Both the *hispida* and *robusta* varieties are important components of the Great Lakes rotifer community. *Keratella cochlearis* var. *faluta*, reported by Nauwerck(1972), is adventitious to the Great Lakes plankton and probably endemic to North America.

The diet of *K. cochlearis* consists of particles up to 12 μm in diameter (Edmondson, 1965). Pourriot (1977) reported that the species feeds not only on detritus and bacteria but also on cryptomonads and chrysomonads. Edmondson (1965) found that the flagellate *Chrysochromulina* contributed significantly to the reproductive rate of *K. cochlearis*. The *tecta* form also appears to be a good eutrophic indicator species.

Of the single posterior-spined species, *K. crassa* and *K. earlinae* are major limnetic species of the Great Lakes and inland lakes as well. *Keratella crassa* may be endemic to North America. *Keratella irregularis* has been recorded for the lower Great Lakes (Nauwerck, 1972) and in the shield lakes of Ontario (Shindler and Novén, 1971). This species, which is common in Europe, may be a recent invader to the Great Lakes. It superficially resembles *K. earlinae* with which it may be confused. Measurements and variation between lorica length and width among the most common single posterior-spined species, forms and varieties are presented in TABLE 2 and Figure 12 as an aid to identification.

Keratella quadrata is eurythermous and may be present throughout the year. The species *K. canadensis* Berzins 1954, reported in the Great Lakes as *K. quadrata* var. *canadensis* Berzins 1954 has been shown to be a synonym for *K. quadrata* (George and Fernando, 1969).

Keratella hiemalis, a cold stenotherm, is most prevalent during winter months and has a eurytopic distribution in inland lakes (Gannon and Stemberger, 1978). The species often co-occurs with *K. quadrata*.

Keratella taurocephala is adventitious to the Great Lakes plankton and is common to acid bogs (Bricker and Gannon, 1976; Gannon and Stemberger, 1978). This species also occurs in shield lakes of Ontario which have low specific conductance (Shindler and Novén, 1971).

Keratella valga varies greatly morphologically and a large number of forms and varieties have been created (Ahlstrom, 1943). The species is rare in the Laurentian Great Lakes.

Keratella serrulata f. *curvicornis* commonly occurs in shallow, weedy, hard-water inland lakes of northern Michigan (Stemberger, unpublished) and is probably adventitious to the Great Lakes plankton.

The inland lake and pond species *Keratella ticinensis*, *K. mixta* and *K. testudo* are presented on Plate 27.

Additional references: Pejler, 1962*a*, *b*, 1977*b*; Sudzuki, 1964; Hilbricht-Ilkowska, 1967; and Koste, 1976.

TABLE 2. PERTINENT MEASUREMENTS FOR SINGLE POSTERIOR-SPINED FORMS OF *KERATELLA*[a]

Keratella Forms	Range	Mean	SD	N[b]
K. cochlearis cochlearis				
LL[c]	113.3-200.5	162.44	16.96	193
LW	48.2-72.3	58.20	4.07	191
PS	14.7-81.0	51.33	11.64	191
AMS	18.4-34.3	24.33	2.71	187
AIS	9.8-22.6	16.17	2.25	186
ALS	11.0-27.0	18.93	2.60	185
K. crassa				
LL	192.8-236.2	207.28	14.41	18
LW	79.5-101.2	90.72	6.00	18
PS	34.3-81.9	63.13	10.41	18
AMS	24.5-41.7	30.69	4.54	15
AIS	17.2-24.5	19.53	1.91	15
ALS	18.4-35.5	27.51	4.91	15
K. earlinae				
LL	185.6-236.2	212.84	12.31	44
LW	62.7-77.1	72.80	4.20	43
PS	67.5-101.2	82.72	8.14	44
AMS	23.3-41.7	31.78	4.23	44

(continued)

TABLE 2 (continued)

Keratella Forms	Range	Mean	SD	N[b]
K. earlinae continued				
AIS	14.7-23.3	18.96	2.14	44
ALS	15.9-29.4	25.50	2.94	44
K. c. hispida				
LL	130.1-226.5	179.36	23.82	31
LW	57.8-77.1	68.08	4.83	31
PS	24.1-91.6	59.31	15.93	31
AMS	24.5-44.0	30.01	5.08	29
AIS	12.3-22.1	17.71	2.24	29
ALS	14.7-28.2	21.79	3.83	29
K. c. robusta				
LL	173.5-231.4	206.11	15.38	21
LW	67.5-74.7	71.73	3.12	21
PS	60.3-91.6	76.68	9.75	21
AMS	20.6-36.8	30.90	3.56	18
AIS	11.0-22.1	18.01	2.79	19
ALS	17.2-28.2	23.86	2.58	19

[a] All measurements given are in micrometers.

[b] Number of individuals measured.

[c] Abbreviations: LL = lorica length; LW = lorica width; PS = posterior spine; AMS = anteromedian spines; AIS = anterointermediate spines; ALS = anterolateral spines.

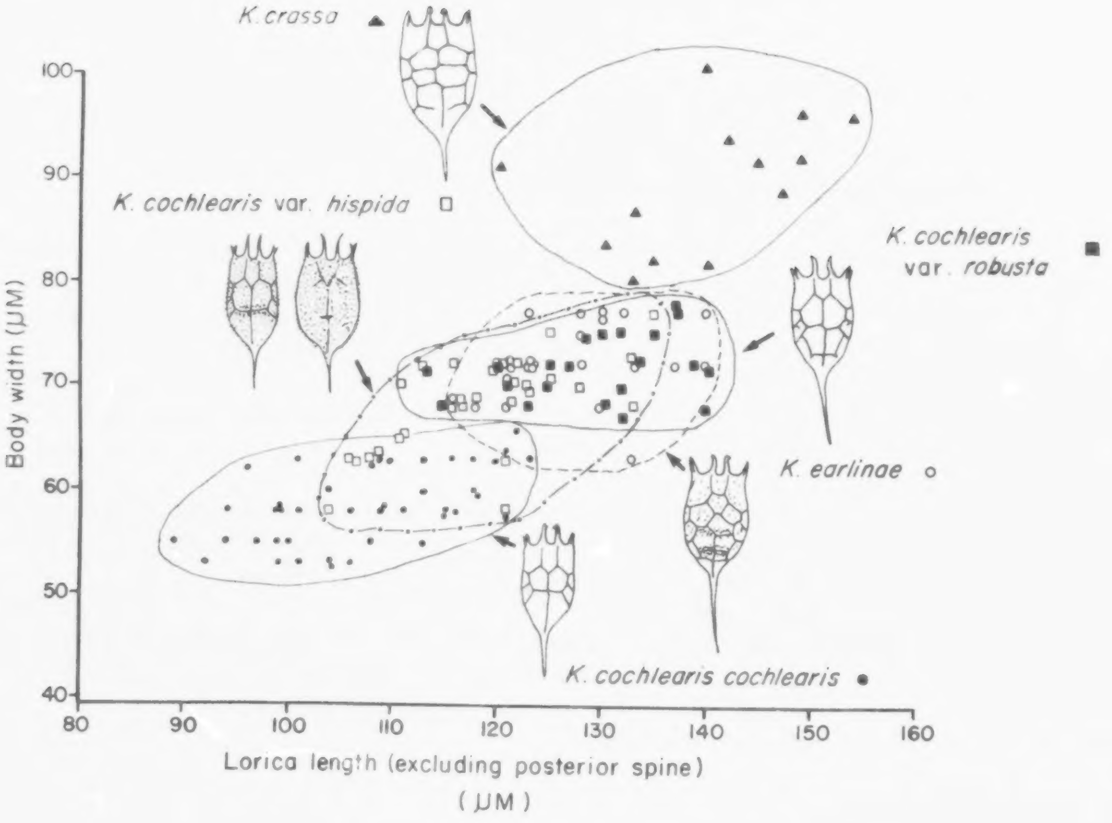


Figure 12. Variation in lorica length and width among single posterior-spined *Keratella*.

Key to Species

1 Lorica with one or two posterior spines 2
Lorica without posterior spines 3

2(1) Lorica with single posterior spine 4
Lorica with two posterolateral spines 6

3(1) Lorica densely covered with spinelets; LL 187-218 µm; LW 100-104 µm; ALS 38-44 µm; AIS 27-29 µm; AMS 68-71 µm: *K. serrulata* f. *curvicornis*
Lorica without spinelets; LL 89-118 µm; LW 48-65 µm; ALS 6-21 µm; AIS 6-18 µm; AMS 18-31 µm: *K. cochlearis* f. *tecta*

4(2) Posterior spine arising laterally; LL 162-286 µm; LW 71-78 µm; PS 0-121 µm; ALS 25-35 µm; AIS 19-29 µm; AMS 33-36 µm: *K. valga* f. *tropica*
Posterior spine arising medially 5

5(4) Anterolateral spines longer than anteromedian spines and often strongly recurved; LL 182-270 µm; LW 63-78 µm; PS 64-118 µm; ALS 36-57 µm; AIS 14-19 µm; AMS 33-40 µm; DALS 77-140 µm: *K. taurocephala*
Anterolateral spines shorter than anteromedian spines 7

6(2) Posterior spines more than half body length and often bowed; LL 224-385 µm; LW 85-128 µm; PLS 64-182 µm; ALS 24-47 µm; AIS 19-45 µm; AMS 35-64 µm: *K. quadrata*
Posterior spines less than one-third body length and straight; LL 149-200 µm; LW 69-92 µm; PLS 24-51 µm; ALS 19-30 µm; AIS 19-25 µm; AMS 24-40 µm: *K. hiemalis*

7(5) Ridges of anteromedian surface straight-lined posteriorly (perpendicular to long axis of body), giving appearance of open rectangle; lorica strongly pustulate, especially along polygonal ridges; median polygonal facet present; LL 152-244 µm; LW 63-77 µm; PS 37-112 µm; ALS 23-30 µm; AIS 18-22 µm; AMS 34-42 µm: *K. earlinae*

Ridges of anteromedian surface of dorsal plate v-shaped posteriorly (an unclosed polygon) 8

8(7) Median polygonal facet on dorsal plate present, located between two pairs of polygonal facets; ridges of polygonal facets well developed; lorica pustulate; LL 152-212 µm; LW 66-73 µm; PS 37-77 µm; ALS 22-25 µm; AIS 14-19 µm, AMS 35-38 µm: *K. irregularis*

Median polygonal facet absent; mediodorsal lorica surface divided into two, four, or six polygonal facets arranged in pairs 9

9(8) Two or three pairs of distinct polygonal facets present on mediodorsal lorica surface; lorica opaque and notably thickened; body robust and wide; LL 140-244 µm; LW 73-101 µm; PS 19-82 µm; ALS 19-40 µm; AIS 13-22 µm; AMS 27-49 µm: *K. crassa*

One or two pairs of indistinct polygonal facets on mediodorsal lorica surface; lorica translucent; posterior spine length variable: *K. cochlearis* complex ... 10

Key to forms and varieties of *K. cochlearis*

10(9) Posterior spine stout and wide at base; LL 185-320 µm; LW 76-106 µm; PS 46-128 µm; ALS 15-33 µm; AIS 11-30 µm; AMS 23-45 µm: *K. cochlearis* var. *faluta*

Posterior spine slender and narrow at base 11

11(10) Lorica covered with spinelets; polygonal facets often indistinct; LL 162-237 µm; LW 58-77 µm; PS 38-91 µm; ALS 18-28 µm; AIS 14-22 µm; AMS 29-38 µm: *K. c. hispida*

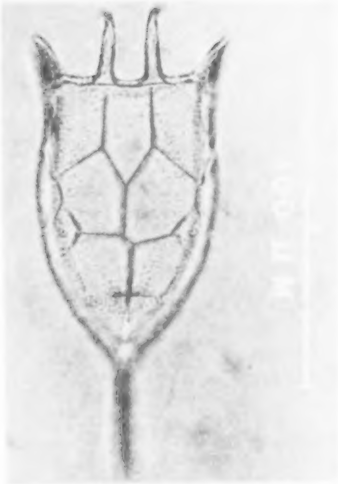
Lorica not covered with spinelets 12

12(11) Posterior spine approximately 0.3-0.4 total lorica length; posterior polygons usually closed; LL 180-232 µm; LW 66-78 µm; PS 60-91 µm; ALS 22-30 µm; AIS 14-22 µm; AMS 31-38 µm: *K. c. robusta*

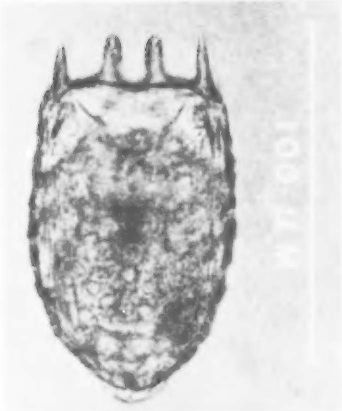
Posterior spine less than 0.3 total lorica length or absent 13

13(12) Posterior spine approximately 0.2-0.3 total lorica length; one or two pairs of polygonal facets on mediodorsal lorica surface; posterior polygons usually open; LL 92-217 µm; LW 45-68 µm; PS 3-100 µm; ALS 11-25 µm; AIS 9-22 µm; AMS 22-36 µm: *K. c. cochlearis*

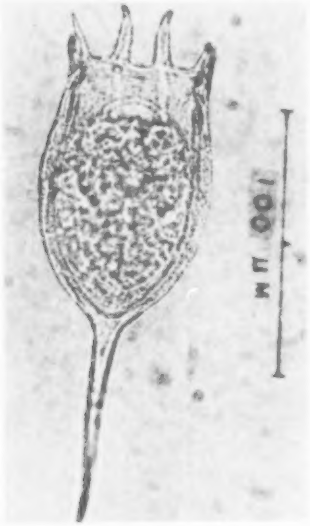
Posterior spine absent: *K. c. tecta*



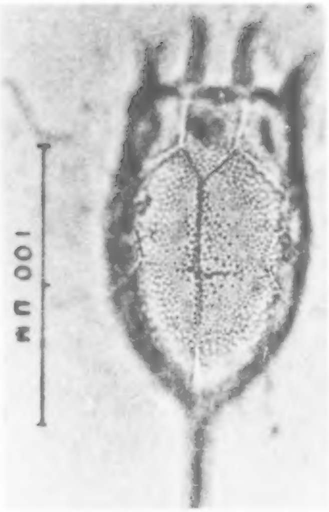
K. cochlearis cochlearis



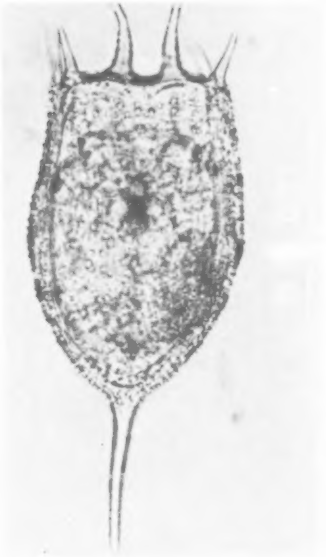
K. cochlearis f. *tecta*



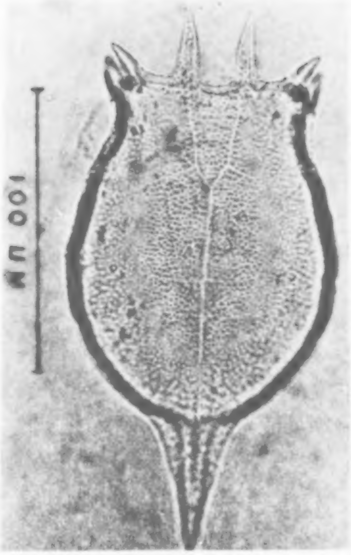
K. cochlearis var. *robusta*



K. cochlearis var. *robusta*, dorsal lorica surface

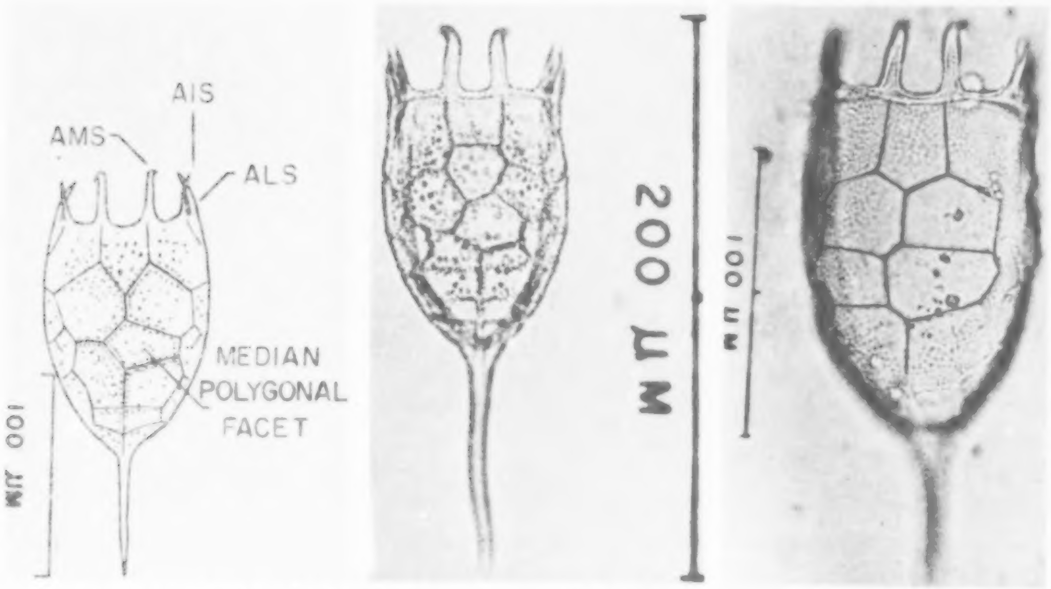


K. cochlearis var. *hispida*

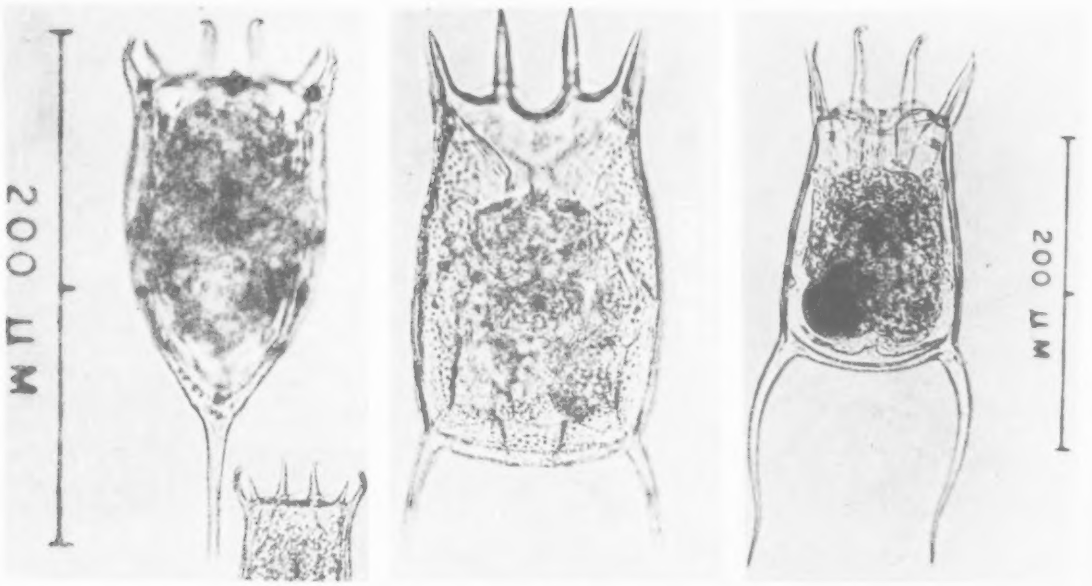


K. cochlearis var. *faluta*

Plate 25. *Keratella* species.

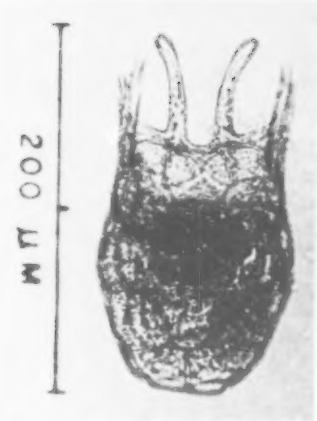

AIS
AMS
ALS
MEDIAN POLYGONAL FACET
100 µm
200 µm
100 µm

K. irregularis (modified from Ahlstrom 1943) *K. earlinae* *K. crassa*

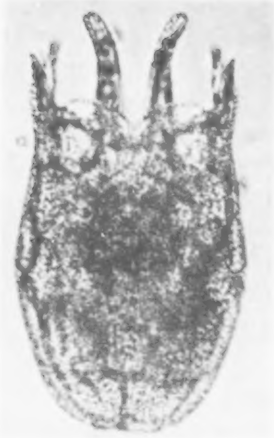

200 µm
200 µm

K. taurocephala *K. hiemalis* *K. quadrata*

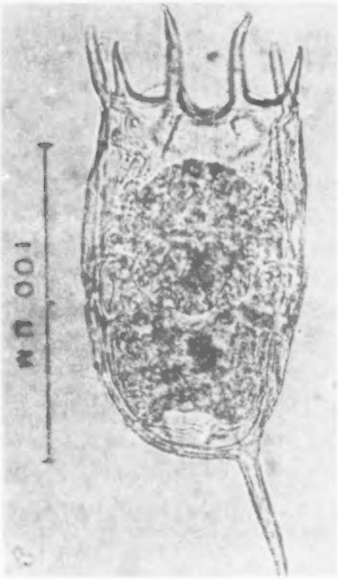
Plate 26. *Keratella* species.



K. serrulata f. *curvicornis*, dorsal view

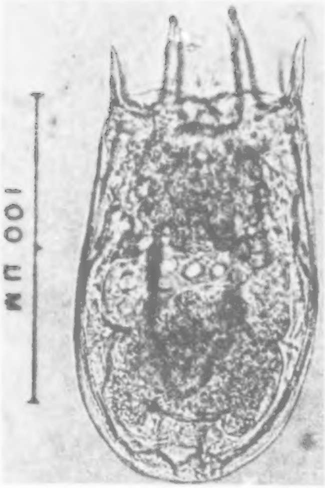


K. serrulata f. *curvicornis*, ventral view

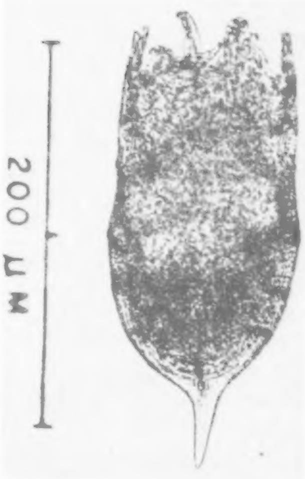


K. valga f. *tropica*

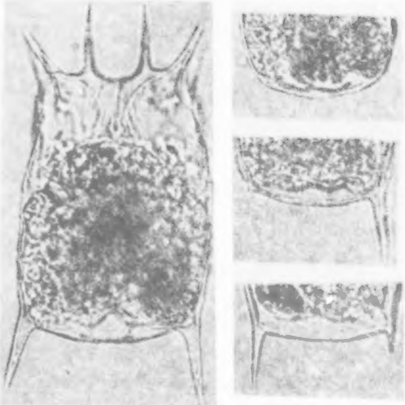
Additional Species



K. ticinensis



K. mixta



K. testudo and variations in posterior spine development

Plate 27. *Keratella* species.

GENUS *LECANE* NITZSCH 1827 (malleate trophi)

Some authors combine *Lecane* and *Monostyla* species under the single genus *Lecane*, as suggested by Edmondson (1935). However, for practical purposes, these genera are treated separately in this guide. Although species are common to shallow, littoral areas, they are frequently encountered in the limnetic zone, especially in eutrophic environments such as harbors and river mouths. The most commonly reported *Lecane* species are *L. luna* and *L. flexilis*. Because of the large number of species in this genus, additional species not covered in the guide may be found in the Great Lakes. Species occur primarily from late spring through fall. Fifteen species have been reported, mainly from the littoral zone of the Great Lakes (Appendix A). The only reported Great Lakes species without a well developed lorica is *L. inermis*.

Photomicrographs of the inland lake and pond species *Lecane signifera*, *L. pyrrha*, *L. stichaea*, and *L. intrasinuata* are presented on Plate 31 and *L. ligona*, *L. inopinata* and *L. clara* are presented on Plate 32.

Additional references: Harring and Myers, 1926 and Chengalath and Mulamoottil, 1974.

Key to Species

1 Ventral plate with one or two posterior spines or extensions 2

Ventral plate without posterior spines or extensions 5

2(1) With single pointed or truncated posterior extension 3

With two pointed spinelike posterior extensions ... 4

3(2) Posterior extension pointed; VPL 162 µm; toes 45 µm: *L. ludwigi*

Posterior extension truncated; VPL 116 µm; toes 40 µm: *L. ohioensis*

4(2) Posterior spines usually long and approximately parallel; toes without claw; VPL 130 µm; toes 48 µm: *L. stokesi*

Posterior spines usually short and divergent; toes with claw; VPL 145-240 µm; toes (with claw) 150-165 µm: *L. leontina*

5(1) Anterolateral margin with well developed spines ... 6
Anterolateral margin without spines but may have small lateral cusps 7

6(5) Foot segment extends beyond posterior margin of ventral plate; VPL 90 µm; toe (with claw) 40 µm: *L. crepida*
Foot segment does not extend beyond posterior margin of ventral plate; VPL 126 µm; toes (with claw) 54 µm: *L. mucronata*

7(5) Anterolateral margin with cusps 8
Anterolateral margin without cusps 12

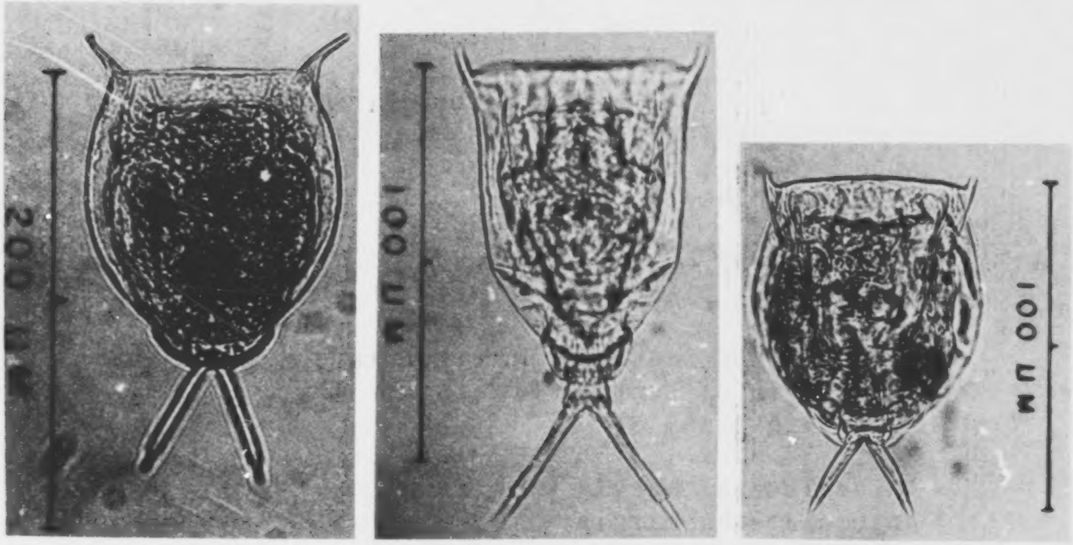
8(7) Foot segment extends beyond posterior margin of ventral plate; VPL 145 µm; toes (with claw) 50 µm: *L. mira*
Foot segment does not extend beyond posterior margin of ventral plate 9

9(8) Toes sharply pointed and continuous without claw; VPL 110 µm; toes 37 µm: *L. tudicola*
Toes terminate with small sharply pointed claw 10

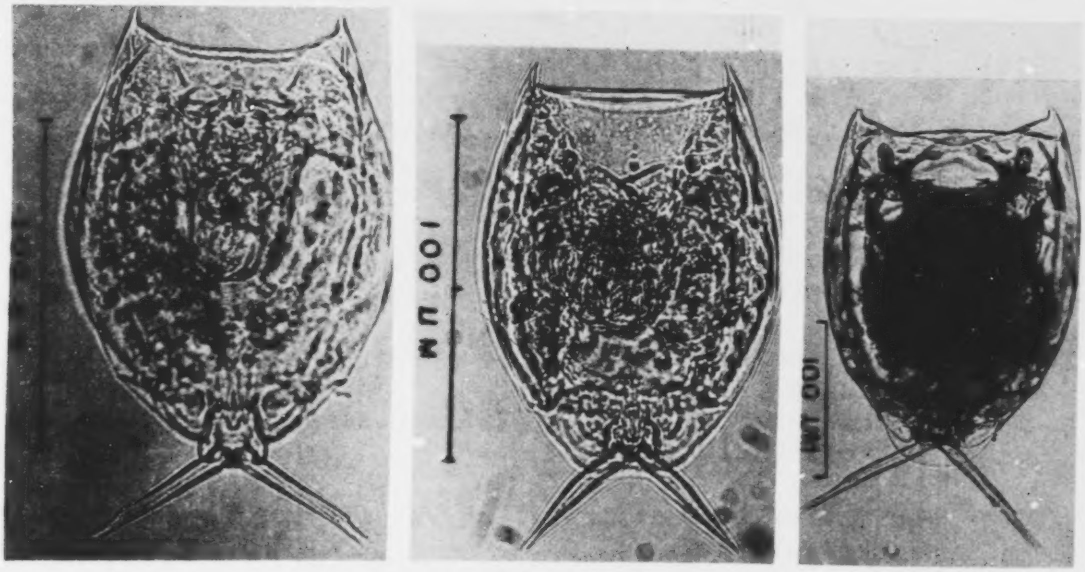
10(9) Anterior margin of dorsal plate concave; VPL 135 µm; toe (with claw) 65 µm: *L. luna*
Anterior margin of dorsal plate straight or convex 11

11(10) Claws short (4 µm); VPL 75-80 µm; toes (with claw) 23 µm: *L. flexilis*
Claws long (45 µm); VPL 255 µm; toes (with claw) 120 µm: *L. ungulata*

12(7) Lorica weakly developed; BL 86 µm; toes (with claw) 28 µm: *L. inermis*
Lorica well developed; VPL 73 µm; LW 56 µm; toes (with claw) 33 µm: *L. tenuiseta*


200 UM
100 UM
100 UM

L. mucronata *L. crepida* *L. flexilis*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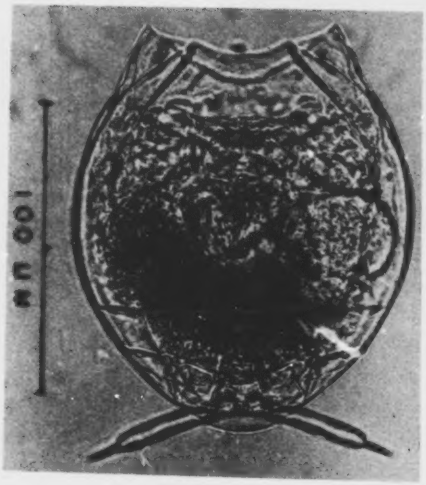
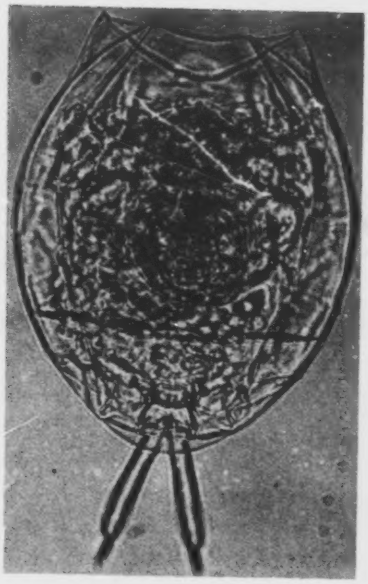
L. mira *L. tudicola* *L. ungulata*

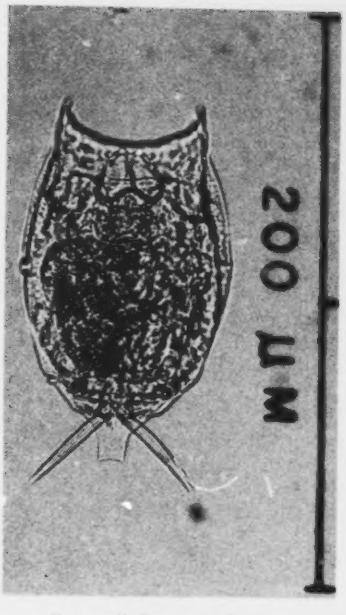
Plate 28. *Lecane* species.



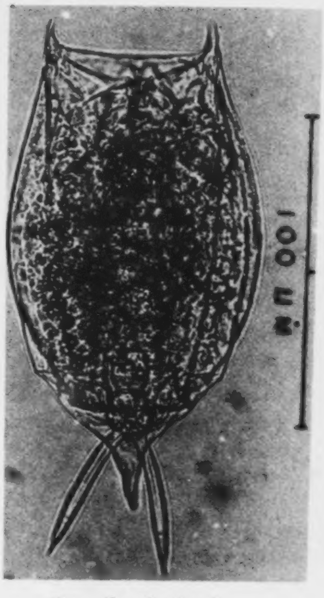
L. luna



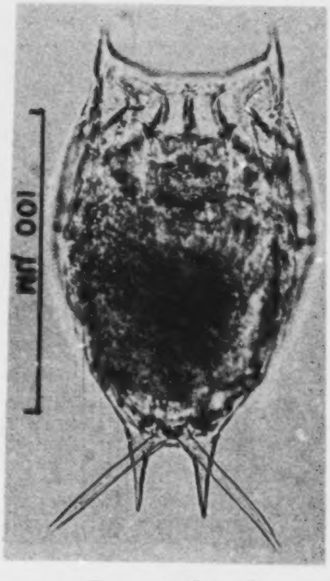
L. luna



L. ohioensis

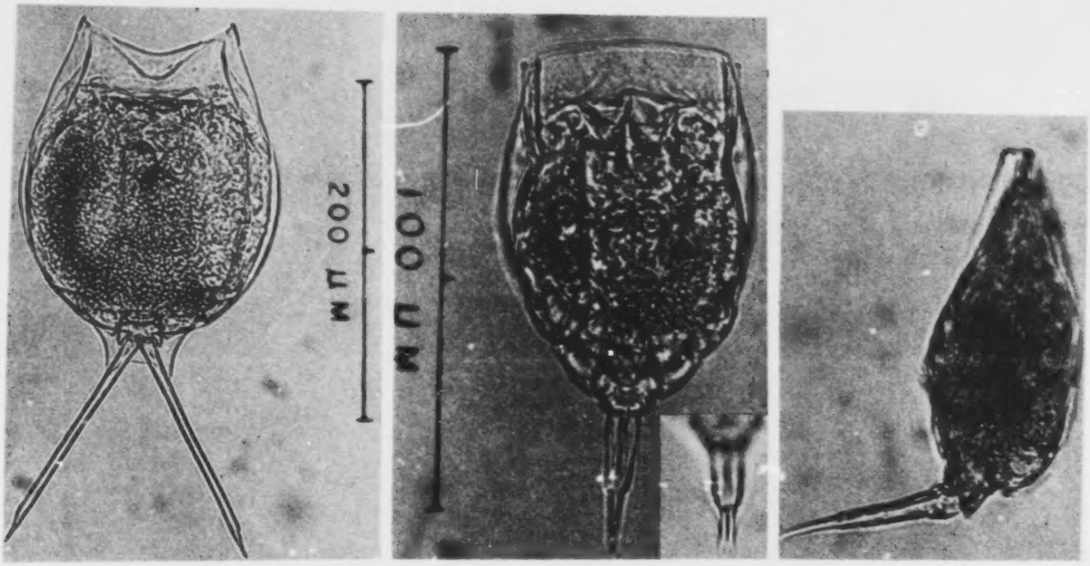


L. ludwigi



L. stokesi

Plate 29. *Lecane* species.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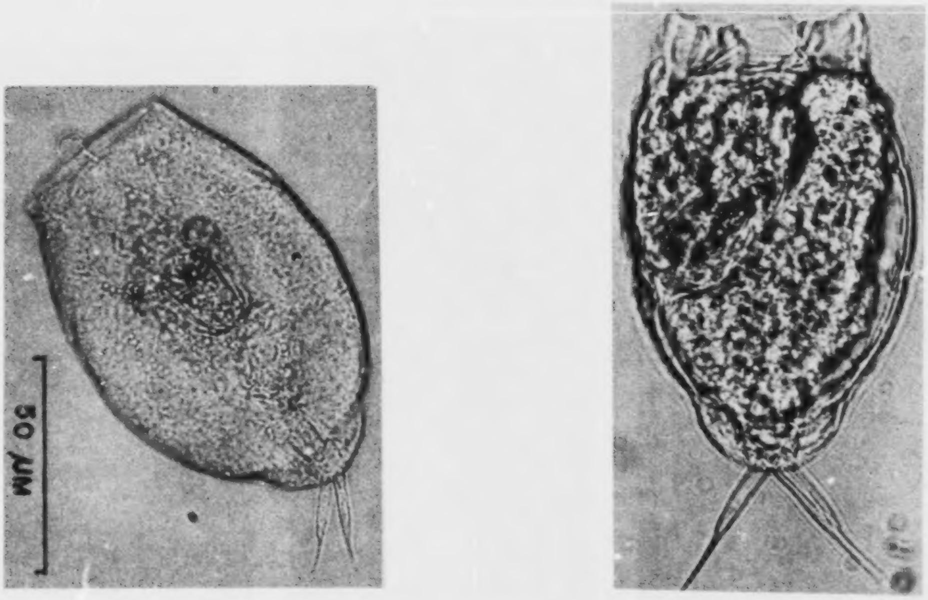
L. leontina

L. tenuiseta

L. tenuiseta, lateral view

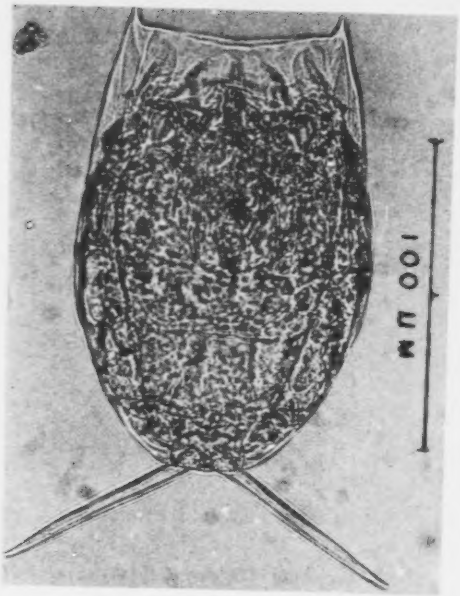


L. inermis

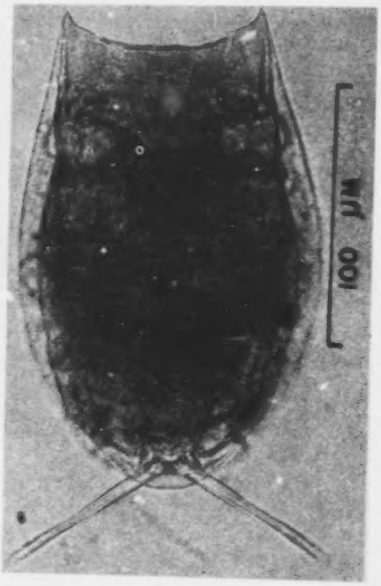
L. inermis

Plate 30. *Lecane* species.

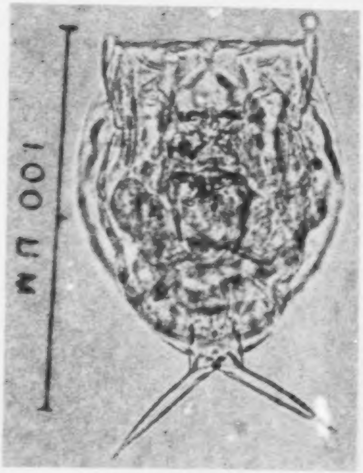
Additional Species



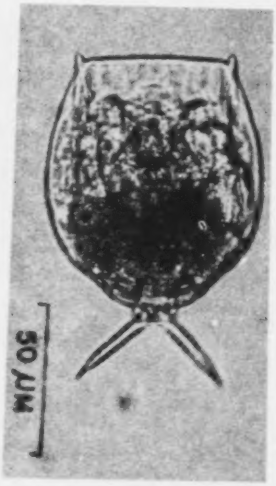
L. signifera



L. pyrrha

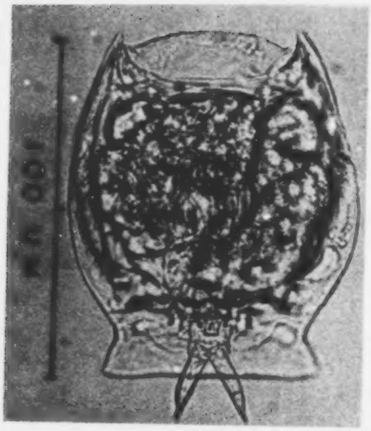


L. stichaea

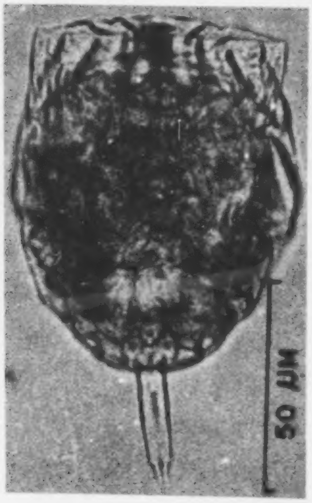


L. intrasinuata

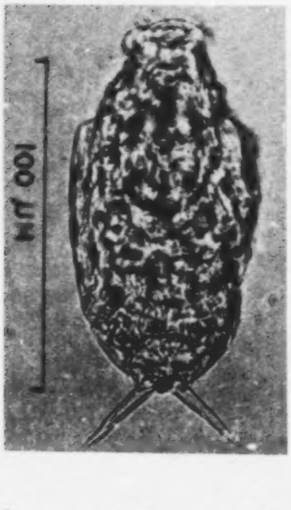
Plate 31. *Lecane* species.



L. ligona



L. inopinata



L. clara, corona extended

Plate 32. *Lecane* species.

GENUS *LEPADELLA* BORY DE ST. VINCENT 1826 (malleate trophi)

Lepadella is a littoral genus uncommon in the limnetic environment of the Great Lakes. *Lepadella patella* and *L. ovalis* are the most frequently reported species.

Photomicrographs of the pond species *Lepadella cristata* are presented on Plate 34.

References: Myers, 1934*c*, Ahlstrom, 1938; Wulfert, 1939; and Chengalath, 1976.

Key to Species

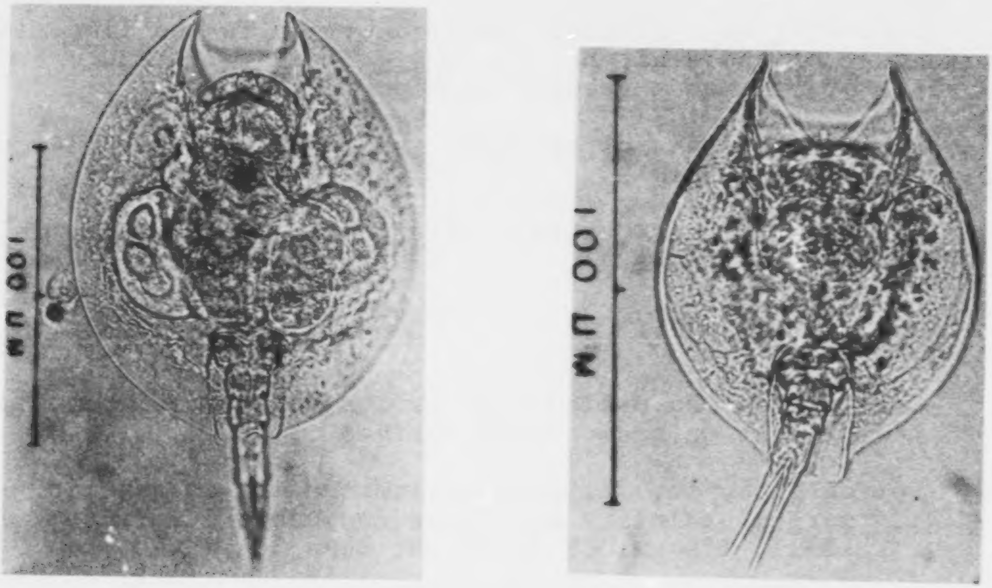
1 Keel present on mediodorsal lorica surface 2
Keel absent on mediodorsal surface 3

2(1) Lorica elongate; stippled collar present at anterior margin of lorica and along mediodorsal surface; LL 110-120 µm; LW 55-88 µm; toes 20-28 µm: *L. rhomboides*
Lorica circular in appearance; stippled collar absent; LL 65-100 µm; LW 53-64 µm; toes 15-20 µm: *L. triptera*

3(1) Posterior or lateral margin rounded without spinelike projections 4
Posterior or lateral margin with spinelike projections 5

4(3) Dorsal plate highly arched; terminal foot segment longest; stippled collar on dorsal plate; LL 90-108 µm; LW 65-90 µm; LD 30-35 µm; toes 22-30 µm: *L. patella*
Dorsal plate moderately arched; terminal foot segment longest; stippled collar on dorsal plate; LL 93-155 µm; LW 70-130 µm; LD 25-30 µm; toes 22-32 µm: *L. ovalis*

5(3) Posterior margin with single spinelike extension arising from foot opening; LL 92-110 µm: LW 55-72 µm; toes 23-35 µm: *L. acuminata*
Posterior and lateral margins with four broad-based extensions; LL 70-94 µm; LW 75-90 µm; toes 19-27 µm (left), 27-32 µm (right): *L. erhrenbergi*


100 UM
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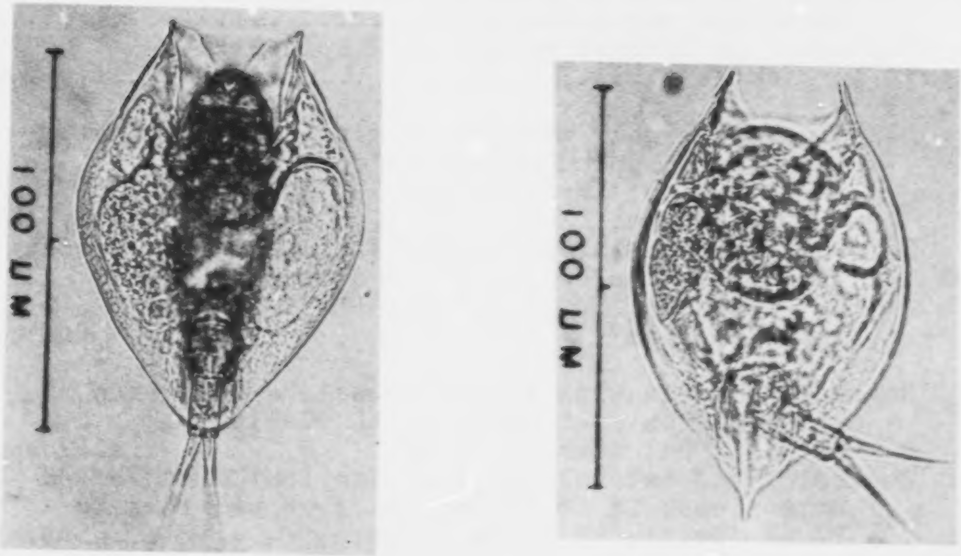
L. ovalis

L. patella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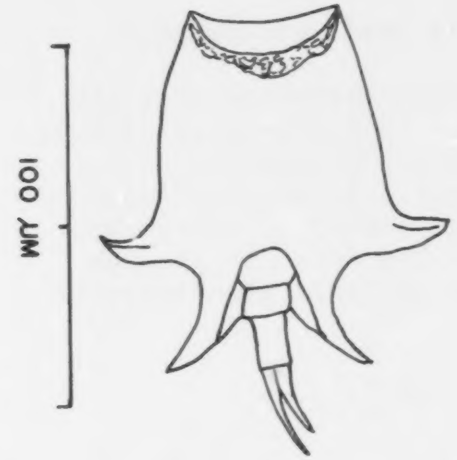
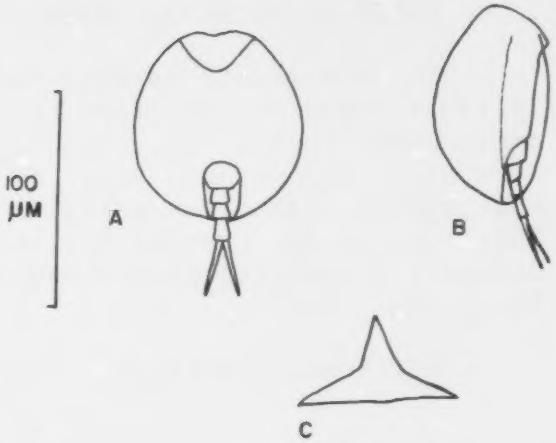
L. rhomboides

L. acuminata

Plate 33. *Lepadella* species.

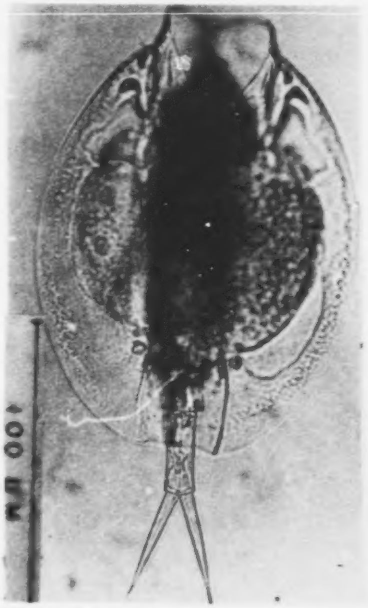


L. ehrenbergi (redrawn from Chengalath, 1976)

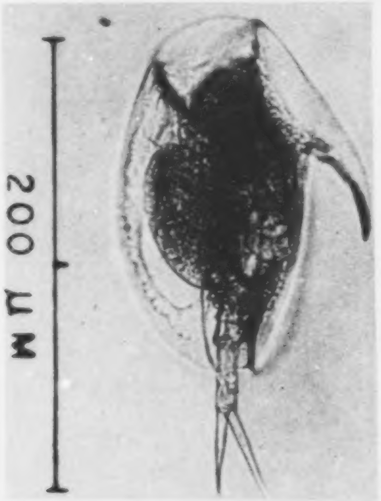


L. triptera; *A*, ventral view; *B*, lateral view; *C*, cross-sectional view (redrawn from Voigt, 1957)

Additional Species



L. cristata, ventral view



L. cristata, lateral view

Plate 34. *Lepadella* species.

GENUS *LOPHOCHARIS* EHRBG. 1838 (malleate trophi)

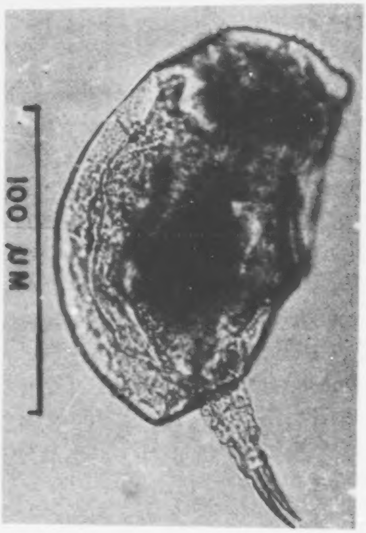
Two *Lophocharis* species have been reported from the littoral areas of the Great Lakes. *Lophocharis salpina* is more common than *L. oxysternon* and may become locally abundant. *Lophocharis salpina* occurs in the planktonic environment near river outfalls and eutrophic embayments. This species was present in Lake Huron from May through October, displaying peak abundance in June (Stemberger et al., 1979).

Additional reference: Voigt, 1957.

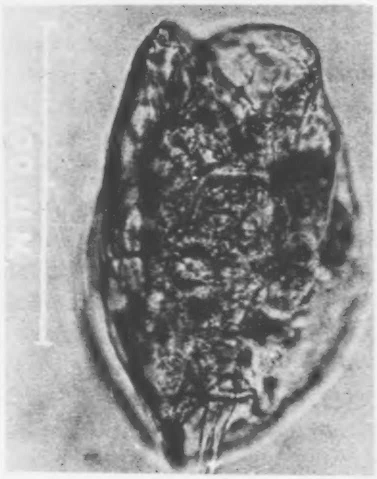
Reported Species

Lophocharis salpina: dorsal keel broadly rounded in cross-sectional view; anterior margin serrated; LL 120-136 µm; toes 25-39 µm.

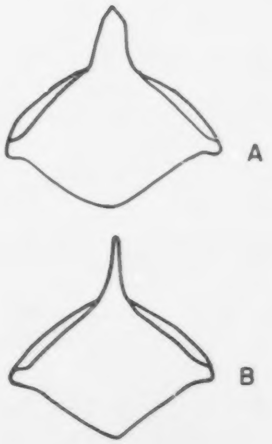
Lophocharis oxysternon: dorsal keel pointed in cross-sectional view; anterior margin not serrated; LL 120 µm; toes 24 µm.



L. salpina, lateral view



L. salpina, ventrolateral view



Cross-sectional views; *a, L. salpina;*
b, L. oxysternon (redrawn from Voigt, 1957)

Plate 35. *Lophocharis* species.

GENUS *MONOSTYLA* EHRENBERG 1830 (malleate trophi)

Some authors combine *Monostyla* and *Lecane* species under the single genus *Lecane*, as suggested by Edmondson (1935). However, for practical purposes, these genera are treated separately in this guide. Species are common to shallow, littoral areas but are frequently encountered in the limnetic zone, especially in eutrophic environments such as harbors and river mouths. The most commonly reported Great Lakes *Monostyla* species are *M. lunaris* and *M. closterocerca*. Because of the large number of species in this genus, additional species not covered in the guide may be found in the Great Lakes. Species occur primarily from late spring through fall. Twelve species have been reported, mainly from the littoral zone of the Great Lakes (Appendix A).

A photomicrograph of the inland lake species *Monostyla crenata* is presented on Plate 37.

Additional references: Harring and Myers, 1926 and Chengalath and Mulamoottil, 1974.

Key to Species

1 Anteromedian spines present; VPL 142 µm; toe (with claw) 68 µm: *M. quadridentata*
Anteromedian spines absent 2

2(1) Anterior margin of lorica straight or slightly concave 3
Anterior margin of lorica with deep sinus 5

3(2) Toe without claw; VPL 78 µm; toe 33 µm: *M. closterocerca*
Toe with claw 4

4(3) Foot segment extends slightly beyond posterior end of body; toe nearly parallel-sided; VPL 80 µm; toe (with claw) 39 µm: *M. obtusa*
Foot segment does not extend beyond posterior end of body; toe widest at middle; VPL 94 µm; toe (with claw) 38 µm: *M. copeis*

5(2) Anterodorsal margin with narrow u-shaped notch; VPL 118 µm; toe (with claw) 58 µm: *M. bulla*

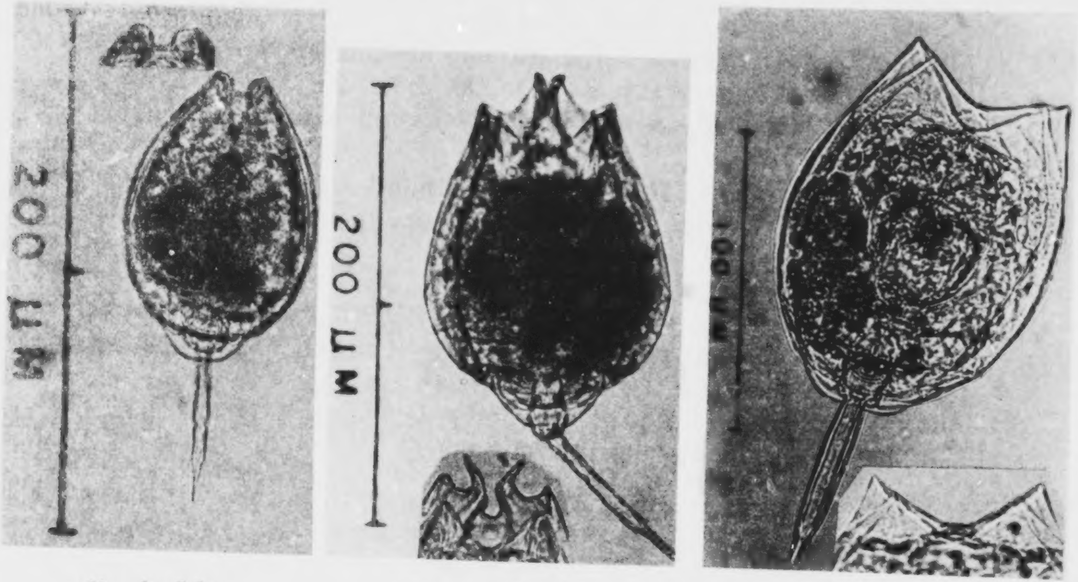
Anterodorsal margin without u-shaped notch 6

6(5) Anterior margin with small incurved cusps; VPL 118 µm; LW 96 µm; toe (with claw) 51 µm: *M. stenroosi*

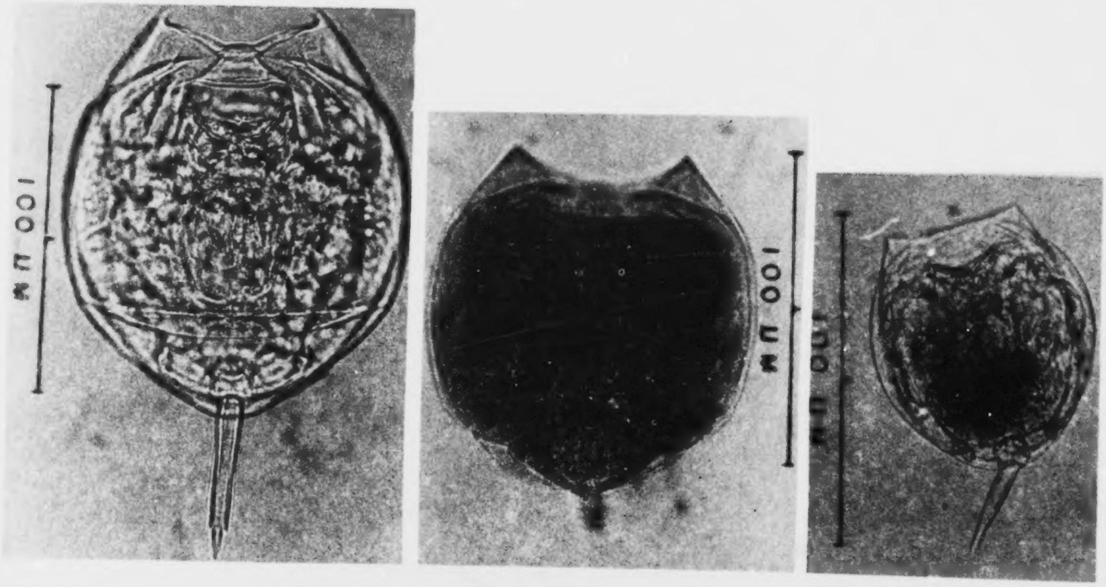
Anterior margin without cusps 7

7(6) Body width about two-thirds body length; VPL 118 µm; LW 86 µm; toe (with claw) 66 µm: *M. lunaris*

Body width about equal to body length; VPL 138 µm; LW 132 µm; toe (with claw) 57 µm: *M. cornuta*

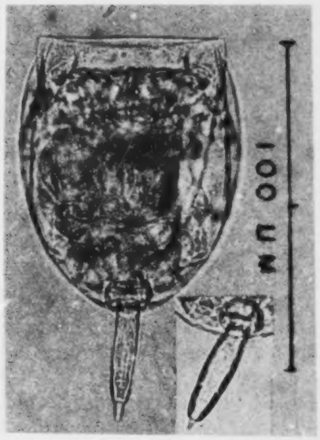

200 µm
200 µm
100 µm

M. bulla *M. quadridentata* *M. lunaris*

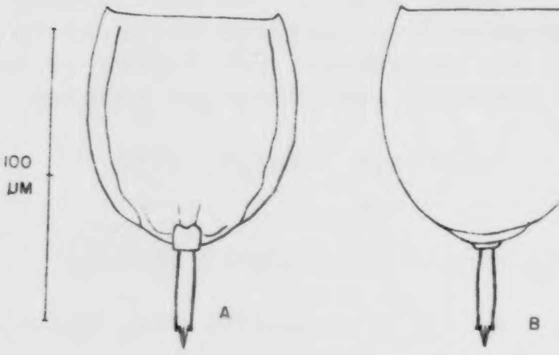

100 µm
100 µm
100 µm

M. stenroosi *M. cornuta* *M. closterocerca*

Plate 36. *Monostyla* species.

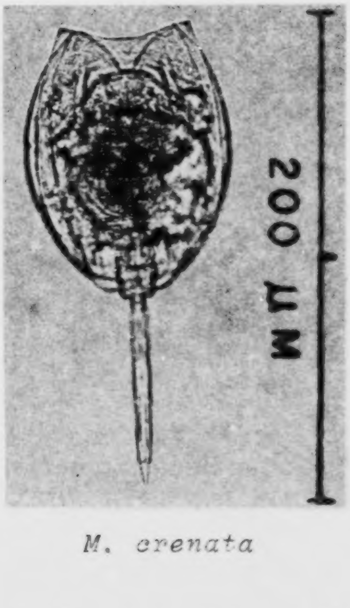


M. copeis



M. obtusa; *A*, ventral view; *B*, lateral view (redrawn from Harring and Myers, 1926)

Additional Species



M. crenata

Plate 37. *Monostyla* species.

GENUS *MYTILINA* BORY DE ST. VINCENT 1826 (malleate trophi)

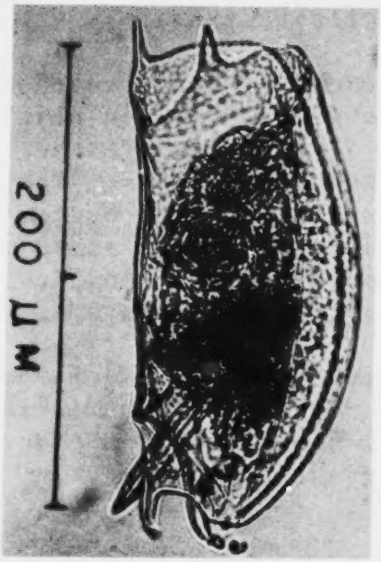
Three species and one variety of *Mytilina* have been reported from littoral areas of the Great Lakes (Appendix A) but are uncommon. The lorica is well developed with spines on anterior and posterior margins.

Reference: Voigt, 1957.

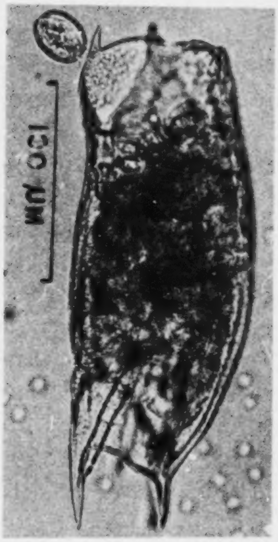
Most Likely Encountered Species

Mytilina ventralis var. *brevispina*: LL 176-215 µm.

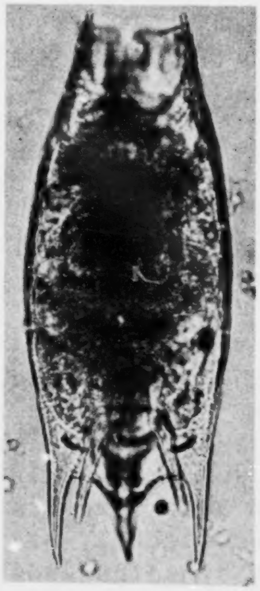
Mytilina ventralis var. *macracantha*: LL 250-350 µm.



M. ventralis var. *brevispina*, lateral view



M. ventralis var. *macracantha*, lateral view



M. ventralis var. *macracantha*, ventral view

Plate 38. *Mytilina* species.

GENUS *NOTHOLCA* GOSSE 1886 (malleate trophi)

Most species in the genus *Notholca* are cold stenotherms and are the primary components of the winter rotifer plankton. *Notholca laurentiae, N. squamula* and *N. foliacea* are the three major species of the genus in the Great Lakes. They display peak abundance during early spring and may occur in the hypolimnion during summer. *Notholca acuminata* is common at inshore areas during winter and spring and is considered stenophagus, feeding primarily on small centric diatoms.

Notholca labis is an uncommon limnetic species of the spring plankton. In inland lakes of northern lower Michigan the species also occurs during summer and fall (Stemberger, unpublished). The species displays great variability in European lakes (Pejler, 1957).

Notholca squamula has small and large forms which occur in the Great Lakes (Stemberger, 1976). Further biometrical studies are needed to establish more firmly the status of this large form. If morphometric discontinuity exists between the forms as well as ecological differences, the large form should be established as a separate species. The large form appears in spring and seems to be locally common at near-shore areas.

Notholca michiganensis, a species reported for Michigan inland lakes, has not been reported for the Great Lakes. The species is morphologically similar to the large form of *N. squamula*. However, the species differ in size, body shape and length of anterior spines (Stemberger, 1976; TABLE 3; Figure 13).

Notholca caudata, the largest and rarest member of the genus in the Great Lakes, is regarded as a possible glacial relict species (Pejler, 1962*c*). A single specimen found in the Straits of Mackinac during June 1976 represents the first record of the species in North America. Its occurrence in the Great Lakes may be accidental, as a result of being carried to North America by ships from European waters.

Additional references: Pejler, 1962*a*, 1977*b*; Kutikova, 1970; Bjorklund, 1972; and Nauwerck, 1972.

TABLE 3. PERTINENT MEASUREMENTS FOR THREE SPECIES OF *NOTHOLCA*[a,b]

Notholca Species	Range	Mean	SD	N[c]
N. laurentiae				
LL[d]	192-250	225.54	10.37	232
LW	115-163	142.08	7.15	232
AMS	14-33	24.96	4.60	232
AIS	6-15	9.94	1.75	53
ALS	4-8	5.38	1.21	37
W/L	0.49-0.86	0.63	0.04	232
N. squamula (typical form)				
LL	112-160	133.43	9.17	230
LW	70-109	90.19	7.88	228
AMS	12-25	19.15	2.31	169
AIS	7-16	9.53	1.78	30
ALS	10-16	14.03	1.44	40
W/L	0.55-0.79	0.68	0.05	228
N. squamula (large form)				
LL	152-196	177.10	10.70	30
LW	120-147	133.60	8.16	30
AMS	12-26	20.50	3.30	30
AIS	3-12	7.00	2.19	30

(continued)

TABLE 3 (continued)

Notholca Species	Range	Mean	SD	N[c]
N. squamula continued				
ALS	12-22	17.10	2.42	30
W/L	0.69-0.87	0.77	0.05	30
N. michiganensis				
LL	180-220	199.51	7.64	269
LW	110-180	144.85	7.29	269
AMS	18-38	28.51	4.15	205
AIS	5-18	9.58	1.82	153
ALS	15-25	19.67	2.22	30
W/L	0.54-0.88	0.73	0.04	269

[a] Modified from Stemberger, 1976.

[b] All measurements given are in micrometers.

[c] Number of individuals measured.

[d] Abbreviations: LL = lorica length; LW = lorica width; AMS = anteromedian spines; AIS = anterointermediate spines; ALS = anterolateral spines; W/L = ratio of lorica width to lorica length.

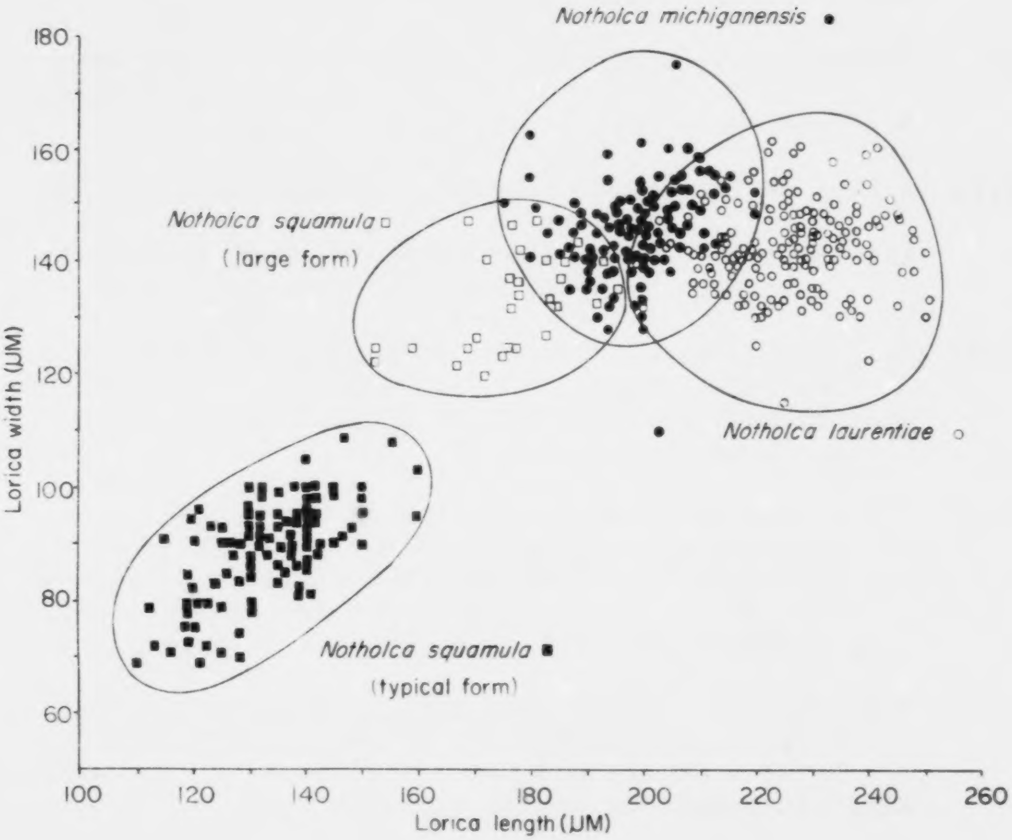


Figure 13. Variation in lorica length and width among three *Notholca* species (modified from Stemberger, 1976).

Key to Species

1 Broad posterior spinelike extension of lorica present and of variable length, either truncated or pointed 2
Posterior margin of lorica rounded, without spinelike projections (gently rounded protrusion may be present) 7

2(1) Posterior extension truncated 3
Posterior extension pointed 6

3(2) Posterior extension long, >100 µm; LL 350-450 µm: *N. acuminata extensa*
Posterior extension short 4

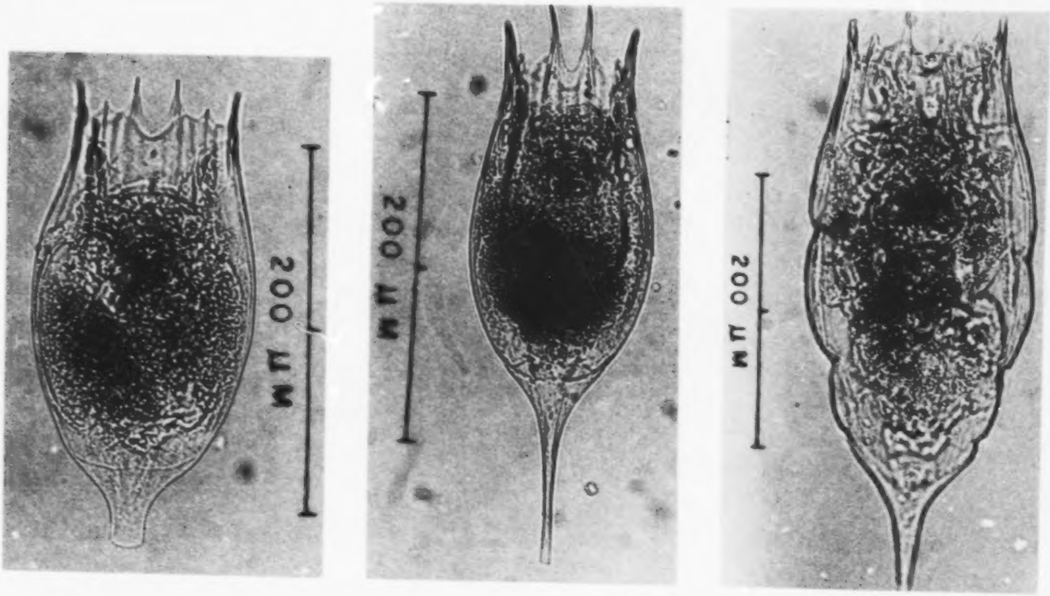
4(3) Anterolateral spines much shorter than anteromedian spines; LL 192-250 µm: *N. laurentiae*
Anterolateral spines approximately equal in length to anteromedian spines 5

5(4) Body elongate; LL 210-350 µm; posterior extension (PE) 15-70 µm: *N. acuminata*
Body rounded posteriorly; LL 160-200 µm; PE 10-50 µm: *N. labis*

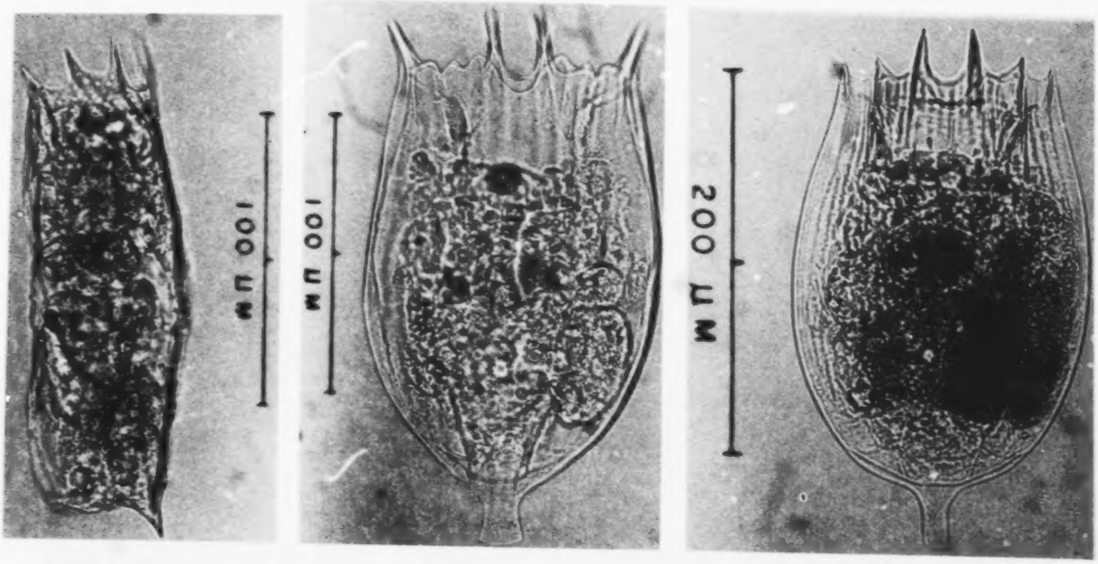
6(2) Short pointed posterior extension projecting slightly dorsad; medioventral ridge present; lorica surface with wavelike striations; LL 140-190 µm: *N. foliacea* (= *Argonotholca foliacea*)
Long pointed posterior extension; LL ∿400 µm: *N. caudata*

7(1) Anterolateral spines shortest; anteromedian spines longest; distinct cleft in posterior margin between dorsal and ventral plates: *N. laurentiae*
Anterointermediate spines shortest 8

8(7) Wrinkles on lorica present; LL 112-160 µm, mean 133 µm: *N. squamula*
Wrinkles on lorica present; LL 152-193 µm, mean 177 µm: *N. squamula* (large form)
Wrinkles on lorica absent; LL 180-220 µm, mean 200 µm: *N. michiganensis*

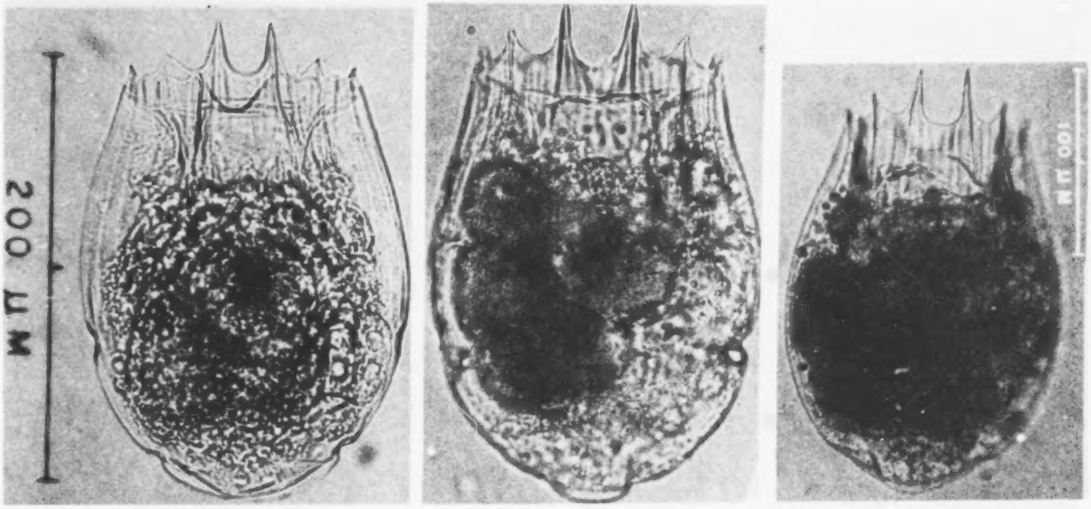

200 µm
200 µm
200 µm

N. acuminata *N. acuminata* var. *extensa* *N. caudata*

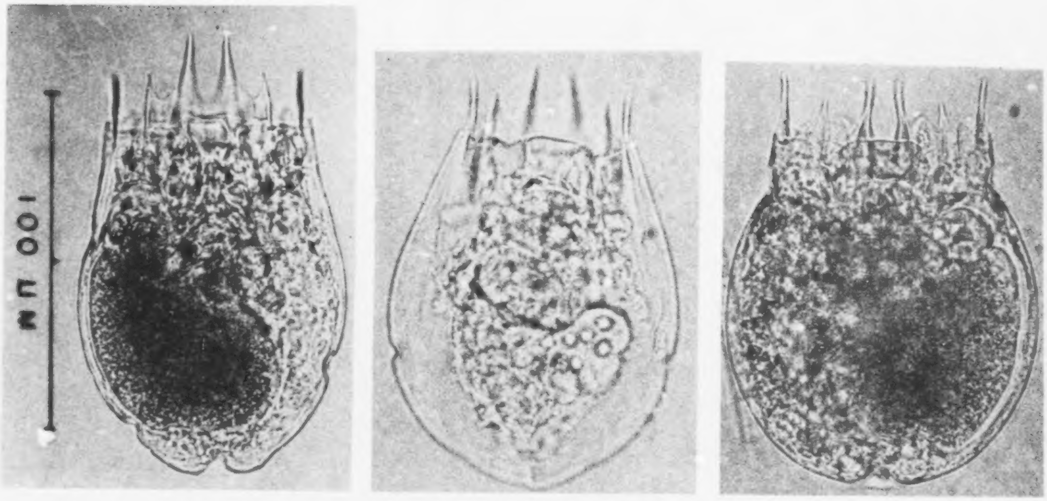

100 µm
100 µm
200 µm

N. foliacea *N. labis* *N. laurentiae* with posterior extension

Plate 39. *Notholca* species.

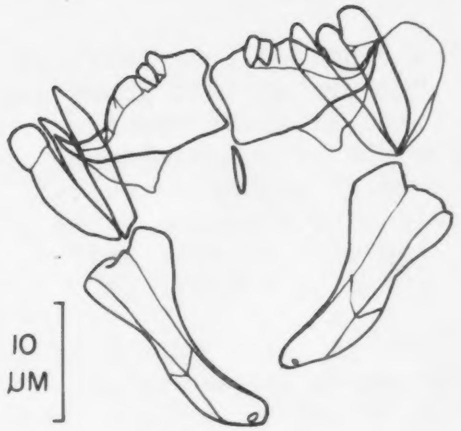

200 μm
100 μm

N. laurentiae *N. laurentiae* *N. laurentiae*

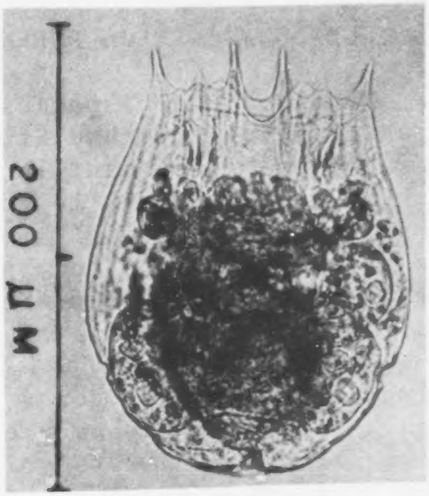


N. squamula *N. squamula* *N. squamula*

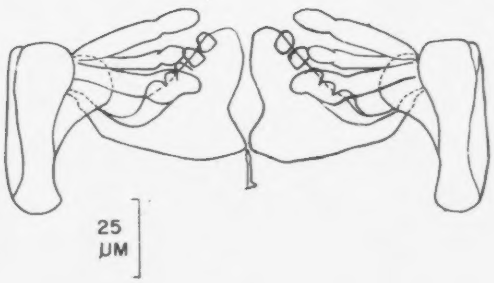
Plate 40. *Notholca* species.



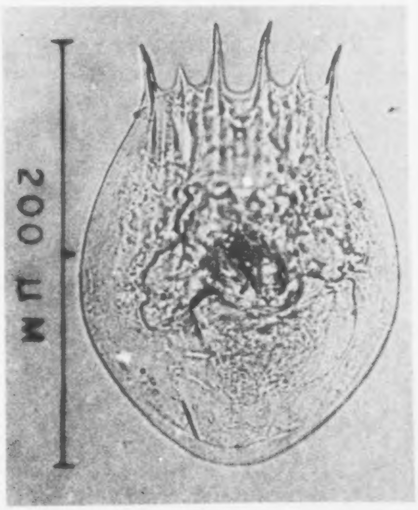
N. squamula trophi (compressed specimen), small form (original drawing)



N. squamula, large form



N. squamula trophi, large form (original drawing)



N. michiganensis

Plate 41. *Notholca* species.

GENUS *NOTOMMATA* EHRENBERG 1830 (virgate trophi)

Nine *Notommata* species have been reported from littoral areas of Lakes Erie and St. Clair. Members of this genus may become locally abundant in shallow littoral areas and are probably adventitious to the limnetic plankton. Although this genus superficially resembles *Proales* and *Encentrum*, the structure of the mouthparts provides an adequate basis for distinction between the genera. Species of this soft-bodied genus may become highly contracted in formalin.

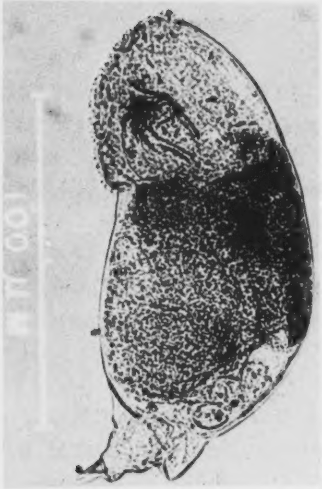
Species in this genus vary greatly in their selection of food. *Notommata copeus* prefers filamentous Zygnematales. *Notommata pachyura* eats solitary desmids and *N. collaris* eats only *Closterium* species. *Notommata aurita* is carnivorous, feeding on other rotifers and their eggs (Pourriot, 1965*a*, 1977).

Additional references: Harring and Myers, 1922, 1924; and Myers, 1933*a*.

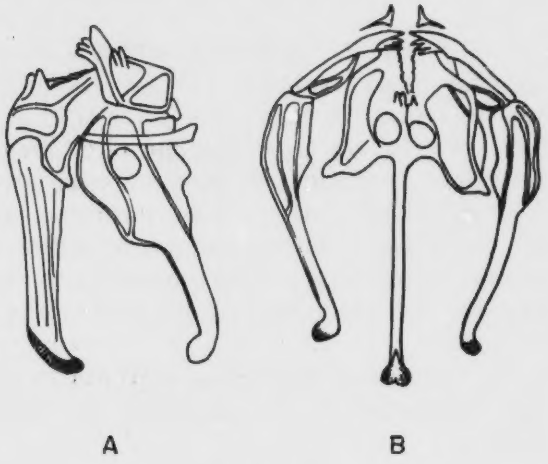
Representative Species

Notommata aurita: TL 250-350 μm; toes 16-20 μm; trophi 36 μm.

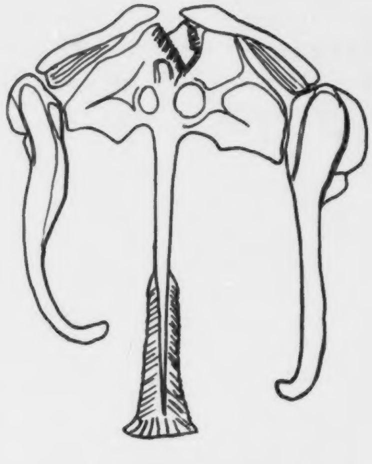
Notommata copeus: TL 600-1,000 μm; toes 50-60 μm; trophi 90-100 μm.



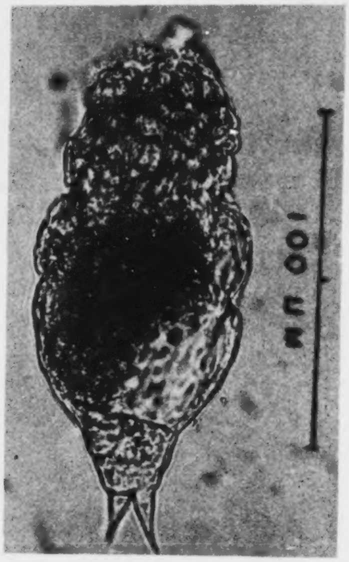
Notommata sp.



N. aurita trophi; *A*, lateral view; *B*, ventral view (redrawn from Harring and Myers, 1922)



N. copeus trophi (redrawn from Harring and Myers, 1922)



Notommata sp., dorsal view

Plate 42. *Notommata* species.

GENUS *PLATYIAS* HARRING 1913 (malleate trophi)

Platyias patulus and *P. quadricornis* have been reported in the Great Lakes. *Platyias patulus* is placed in the genus *Brachionus* by some workers (Wiszniewski, 1954; Wulfert, 1965). Both *Platyias* species have a segmented, moderately rigid foot, whereas species in *Brachionus* have an annulated, soft, retractable foot. The species are uncommon in littoral areas of the Great Lakes and are most frequently encountered during summer months. Their presence in the limnetic environment may be an indication of eutrophy.

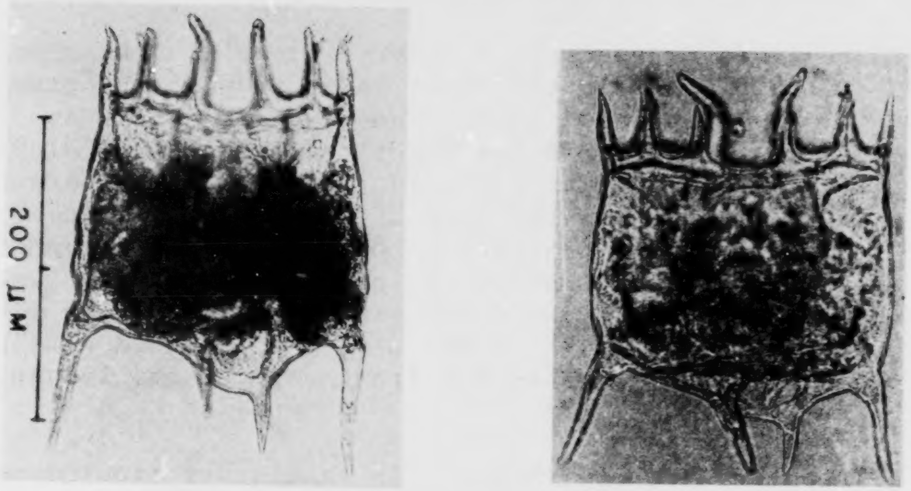
Platyias patulus may be a detritovore but the species was successfully cultured on *Chlorella pyrenoidosa* (Pourriot, 1965*a*).

Additional reference: Ahlstrom, 1940.

Only Reported Species

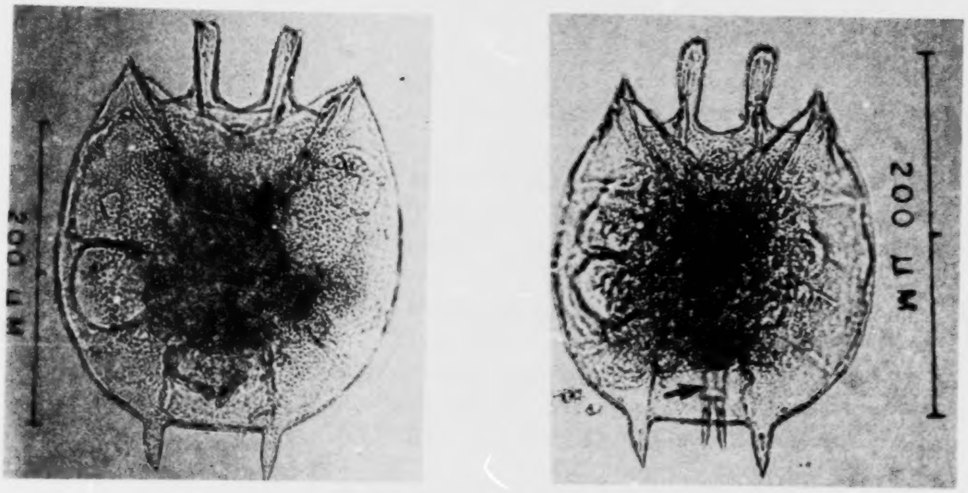
Platyias patulus: four posterior and ten anterior spines present; LL 150-265 μm; LW 108-163 μm; PS 24-86 μm, 15-25 μm, 19-30 μm, 17-82 μm; ALS 29-44 μm; AIS 27-38 μm; AMS 38-50 μm; DALS 98-152 μm; pectoral spines 27-42 μm, 21-28 μm.

Platyias quadricornis: two posterior and two anteromedian spines present; LL 174-360 μm; LW 122-265 μm; PS 17-80 μm; AMS 34-70 μm; DALS 75-152 μm; toes 25-59 μm.



P. patulus

P. patulus


200 μm
200 μm

P. quadricornis

P. quadricornis (arrow indicates foot)

Plate 43. *Platyias* species.

GENUS *PLOESOMA* HERRICK 1885 (virgate trophi)

Three *Ploesoma* species, *P. lenticulare*, *P. truncatum*, and *P. hudsoni*, occur in the Great Lakes from spring through fall, with peak abundance in July and August. *Ploesoma hudsoni* is the least common of the three species and displays the greatest morphological variation in size and appearance of the lorica surface. A large form of this species which exceeds 600 μm in body length has the posterior portion of the body greatly elongated. A fourth species, *P. triacanthum*, commonly occurs in acid and humic waters of the region (Stemberger, unpublished). Myers (1934*b*) described a related species, *Pseudoploesoma formosum* from Mount Desert Island, Maine.

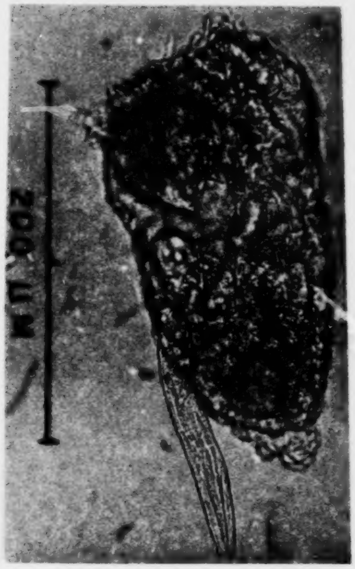
All species are omnivorous. In laboratory experiments, *P. truncatum* from Douglas Lake, Michigan were observed to feed on *Chlamydomonas* and the rotifers *Polyarthra* and *Synchaeta* (Stemberger and Fuller, unpublished). Pourriot (1965*a*) reported cannabilism for *P. hudsoni*. He also found mouthparts of *Hexarthra*, *Filinia*, *Conochiloides* and *Polyarthra* in its gut.

Additional references: Edmondson, 1959 and Ruttner-Kolisko, 1974.

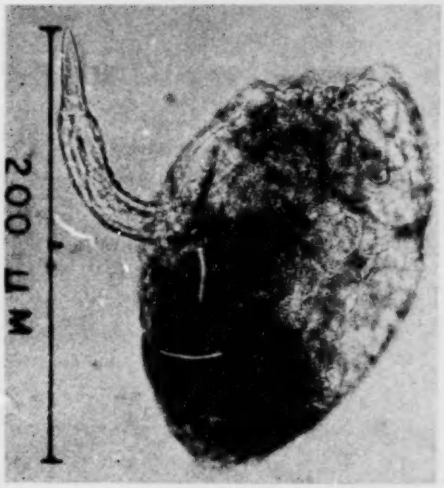
Key to Species

1 Ridge pattern on lorica absent; lorica thin with vesiculate texture; LL 300-600 μm: *P. hudsoni*
Ridge pattern on lorica present 2

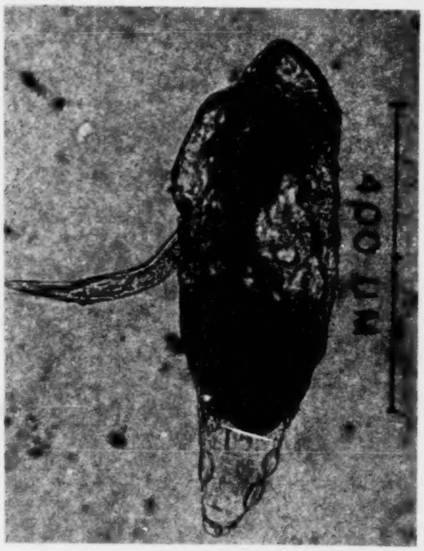
2(1) Anterior margin of lorica straight without spinelike projection; LL 150-300 μm: *P. truncatum*
Anterior margin of lorica with single short, broad-based spine; lorica with honeycombed foundation pattern; LL 150-300 μm: *P. lenticulare*



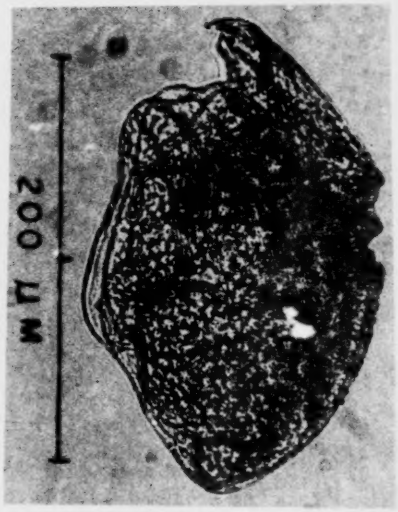
P. hudsoni, small form



P. hudsoni, small form

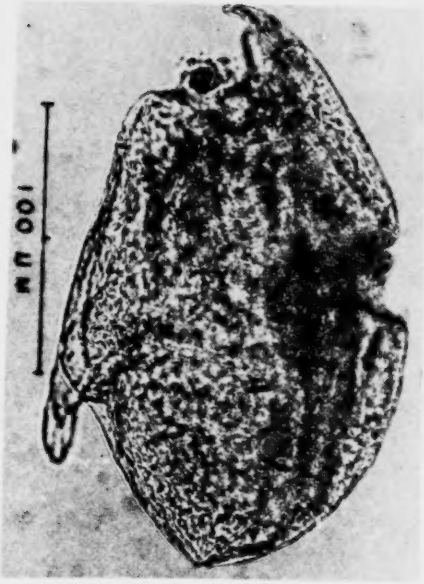


P. hudsoni, large form

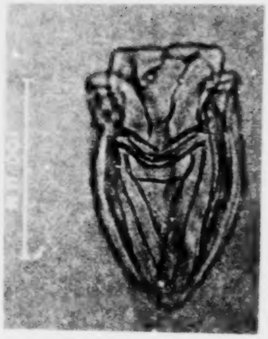


P. lenticulare

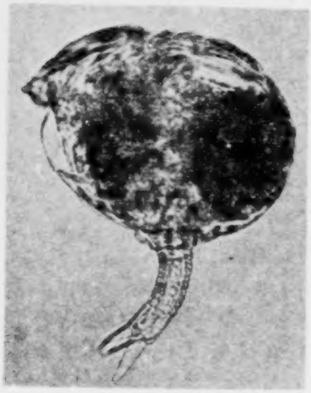
Plate 44. *Ploesoma* species.



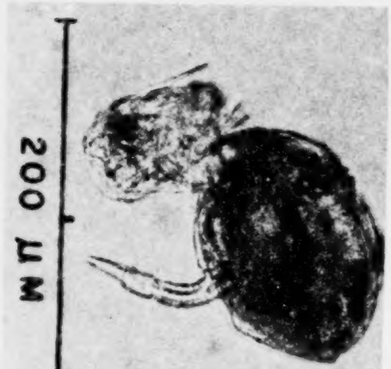
P. lenticulare



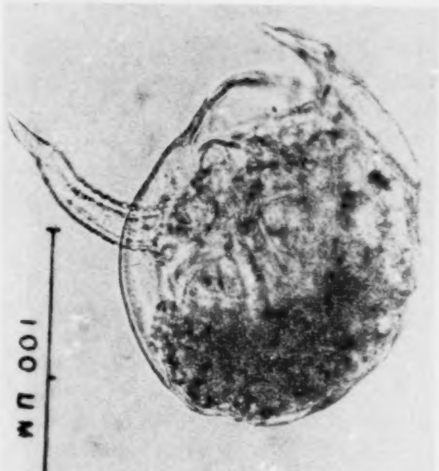
P. truncatum, dorsal view



P. truncatum



P. truncatum with *Polyarthra vulgaris* prey



Additional species:
P. triacanthum

Plate 45. *Ploesoma* species.

GENUS *POLYARTHRA* EHRENBERG 1834 (virgate trophi)

Five *Polyarthra* species which occur in the Great Lakes can usually be distinguished by comparing body and fin length (TABLE 4; Figure 14). *Polyarthra vulgaris* may be perennial and is one of the major rotifer species in the Great Lakes. Its maximum abundance occurs from June through October. *Polyarthra dolichoptera* occurs from March through June. Maximum abundance occurred during May in Lake Huron (Stemberger et al., 1979). *Polyarthra remata* is the smallest of the limnetic species in the genus. It occurs from May through December with peak abundance from October through December. In inland lakes the species may be perennial (Fuller et al., 1977). *Polyarthra major* appears during summer and fall, displaying peak abundance in July and August. The species was present thoughout the year in Douglas Lake, Michigan (Fuller et al., 1977). *Polyarthra euryptera,* a warm stenotherm, occurs during summer and fall. The species was never observed during winter months in inland lakes (Stemberger, unpublished).

Two species of uncertain status, *P. dissimulans* Nipkow and *P. longiremis* Carlin, are apparently transitional forms between *P. vulgaris* and *P. dolichoptera* and have been reported for Lake Ontario by McNaught, Markello and Giovannangelo (1973).

Polyarthra vulgaris eats *Cryptomonas*, *Chrysococcus* and *Rhodomonas* (Edmondson, 1965; Pourriot, 1977). Buikema et al. (1977) raised *P. vulgaris* in culture on cryptophytes and small protozoans of the genus *Bodo*.

Additional references: Carlin, 1943; Nipkow, 1952; Sudzuki, 1964; Nauwerck, 1972; and Guiset, 1977.

TABLE 4. FIN LENGTH AND BODY LENGTH OF *POLYARTHRA*[a,b]

Polyarthra Species	Range	Mean	SD	N[c]
P. vulgaris				
Body Length	90.7-151.9	117.5	10.6	113
Fin Length	78.4-135.0	112.4	11.6	113
P. dolichoptera				
Body Length	83.3-159.3	117.9	12.3	64
Fin Length	135.0-208.3	153.8	13.9	63
P. major				
Body Length	134.8-200.9	162.2	17.6	37
Fin Length	105.4-166.0	133.0	13.7	37
P. euryptera				
Body Length	171.5-188.7	178.4	6.2	10
Fin Length	122.5-149.5	135.8	8.7	10
P. remata				
Body Length	72.0-117.6	91.0	12.0	54
Fin Length	85.0-131.0	109.1	10.5	54

[a] Based on data from Nauwerck (1972) and unpublished data collected from Lake Michigan, Lake Huron, and Douglas Lake (Michigan).

[b] All measurements given are in micrometers.

[c] Number of individuals measured.

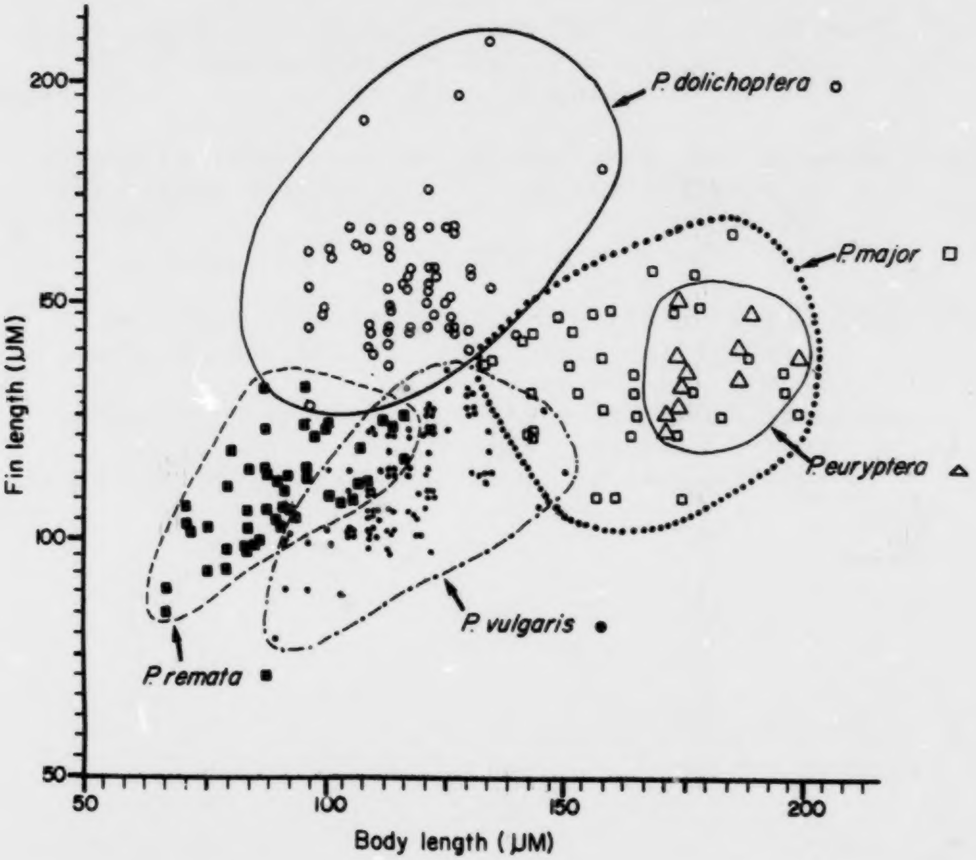


Figure 14. Variation in fin length and body length among five *Polyarthra* species (data derived from Stemberger, unpublished, and Nauwerck, 1972).

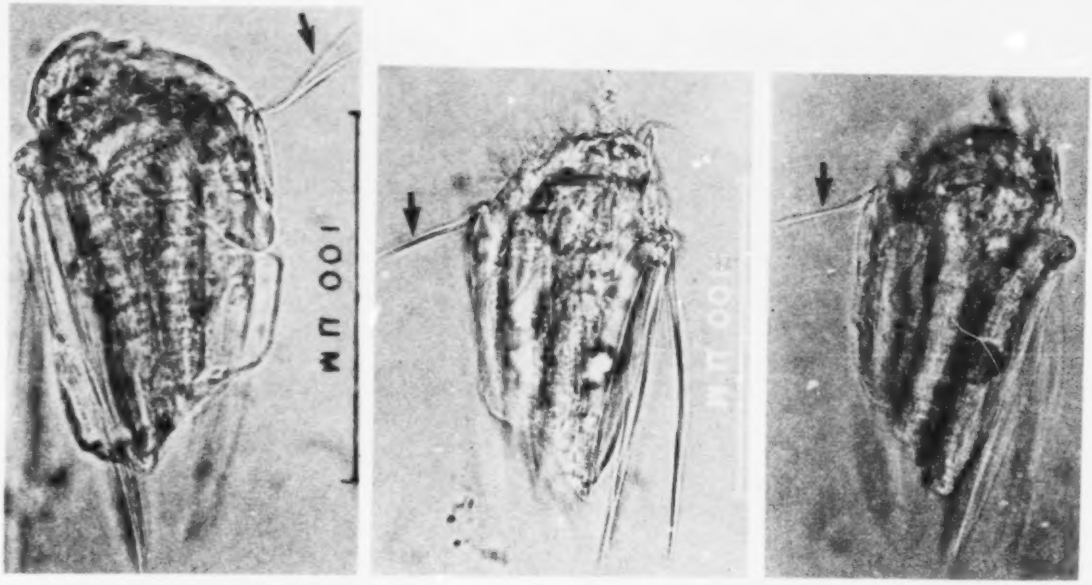
Key to Species

1 With a pair of small ventral fins (finlike appendages) arising from anterior third of ventral body surface 2
Without ventral fins 3

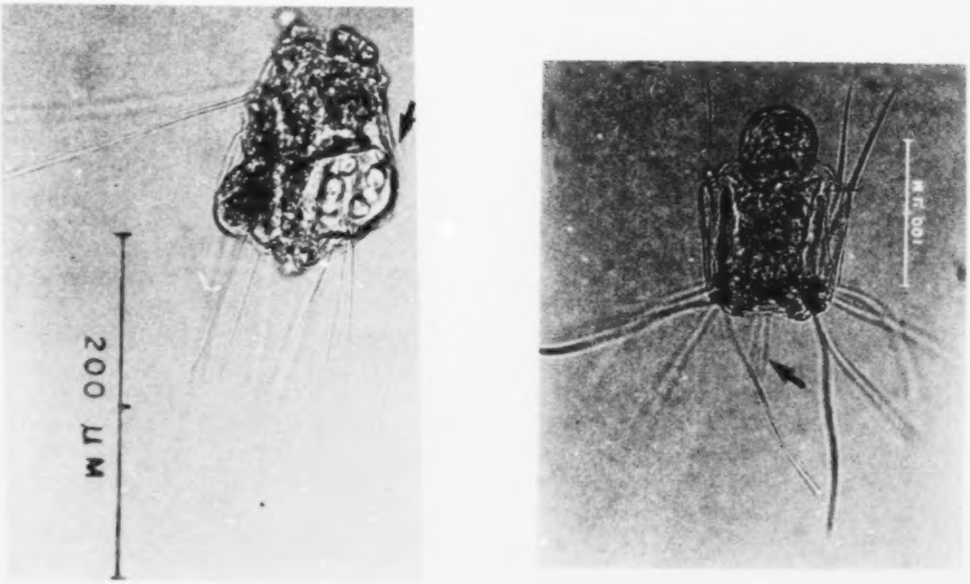
2(1) Narrow swimming fins which extend considerably beyond posterior end of body; 8 nuclei in vitellarium; BL 80-160 μm; fin length 135-210 μm: *P. dolichoptera*
Swimming fins extend only slightly beyond posterior end of body; 8 nuclei in vitellarium; BL 90-150 μm; fin length 70-135 μm: *P. vulgaris*

3(1) Swimming fins wide (50-70 μm) and ovate; 12 nuclei in vitellarium; BL 170-190 μm; fin length 120-150 μm: *P. euryptera*
Swimming fins <50 μm wide 4

4(3) Swimming fins 20-40 μm wide, strongly serrated; 8 nuclei in vitellarium; BL 135-200 μm; fin length 105-170 μm: *P. major*
Swimming fins narrow (<20 μm) and extend slightly beyond posterior end of body; 4 nuclei in vitellarium; BL 70-120 μm; fin length 85-135 μm: *P. remata*

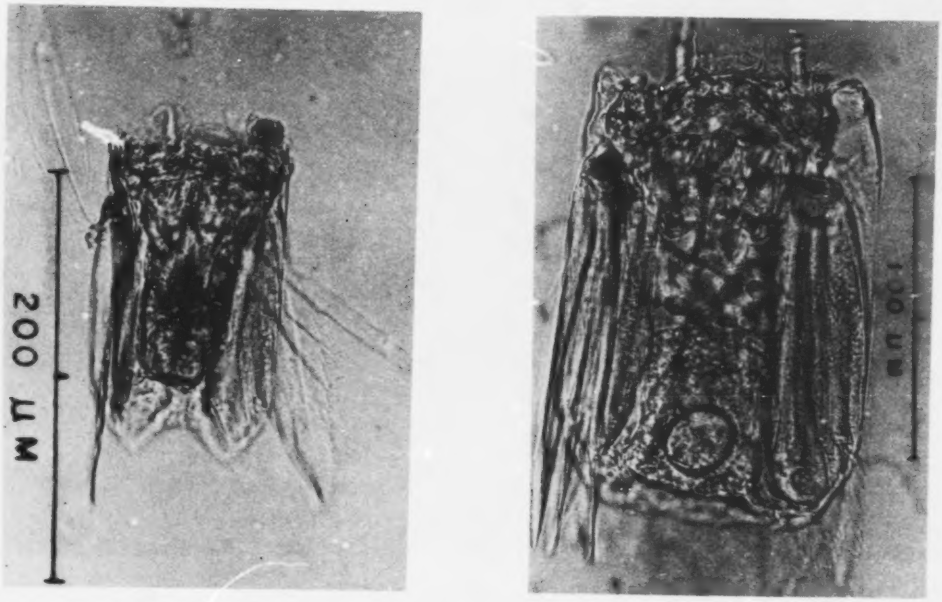

100 μm
100 μm

P. vulgaris (arrow indicates ventral fins) *P. vulgaris* *P. vulgaris*

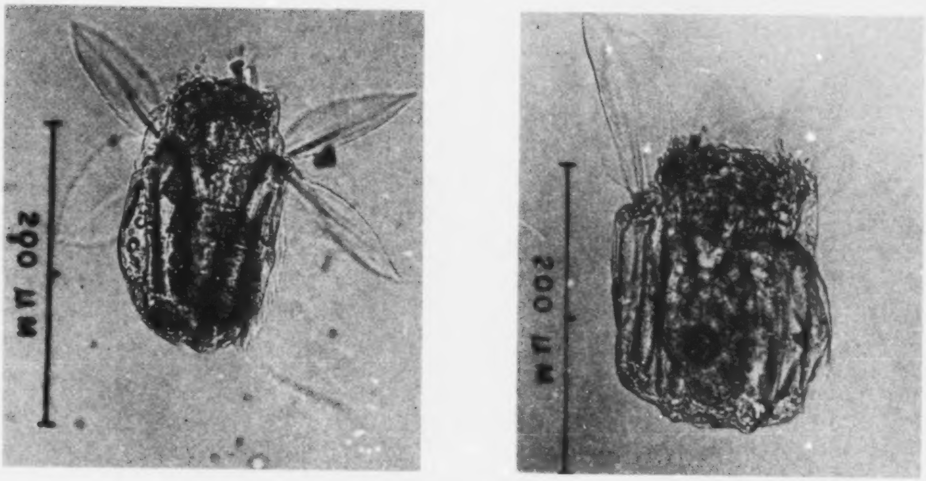

200 μm
100 μm

P. dolichoptera *P. dolichoptera*, with egg

Plate 46. *Polyarthra* species.

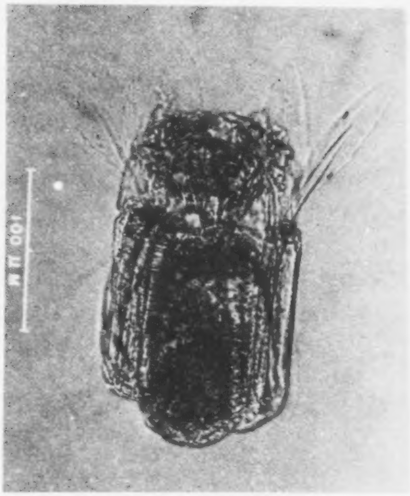

200 µm
100 µm

P. major *P. major*

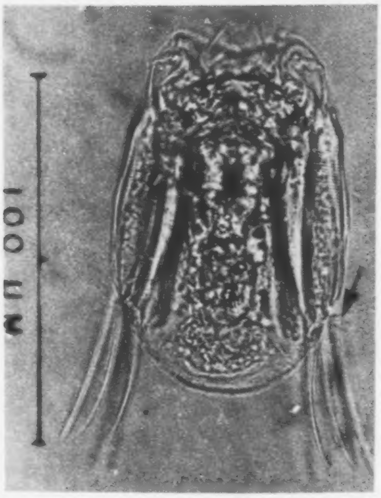

200 µm
200 µm

P. euryptera *P. euryptera*

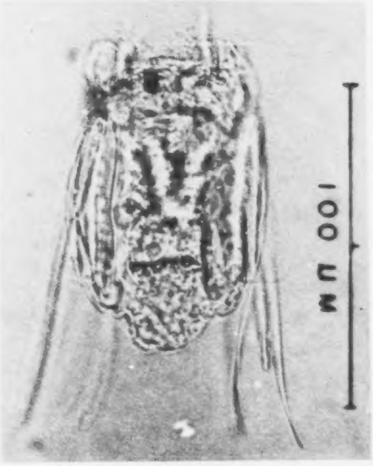
Plate 47. *Polyarthra* species.



P. euryptera



P. remata (arrow indicates lateral antennae)



P. remata

Plate 48. *Polyarthra* species.

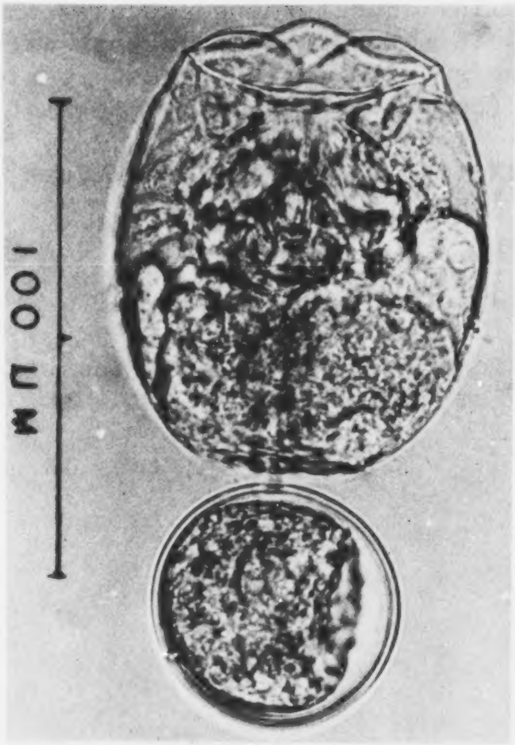
GENUS *POMPHOLYX* GOSSE 1851 (malleoramate trophi)

Although two *Pompholyx* species have been reported for the Great Lakes area (Campbell, 1941; Nauwerck, 1972; Stemberger et al., 1979), it is likely that *P. complanata* is a synonym for the valid species *P. sulcata* (Sudzuki, 1964). The species is eurythermous but displays its greatest abundance during summer. It predominates in nearshore areas and eutrophic embayments and may be a useful indicator of eutrophy in the Great Lakes. *Pompholyx* feeds on detritus and its associated bacteria (Pourriot, 1977).

Additional reference: Ruttner-Kolisko, 1974.

Only Valid Species

Pompholyx sulcata: body ovate; body has four lobes in cross-sectional view; LL 100-120 μm.



Pompholyx sulcata, with egg

Plate 49. *Pompholyx sulcata*

GENUS *PROALES* GOSSE 1886 (malleate trophi)

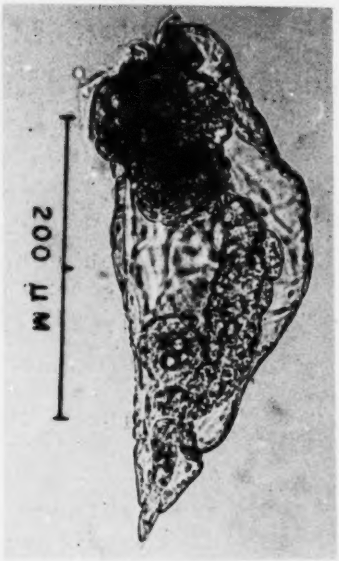
Four species of the genus *Proales* have been reported from littoral environments of Lakes Erie and St. Clair (Appendix A). The species may become locally abundant in harbors and inshore areas. Members of the genus are without a stiffened lorica and may become highly contracted when preserved in formalin. Undetermined species of the genus have been observed in Lake Michigan inshore waters (Stemberger, unpublished). Some species in the genus are algivorous, others omnivorous (Pourriot, 1965*a*).

Additional references: Harring and Myers, 1922, 1924; Myers, 1933*a*; and Koste, 1976.

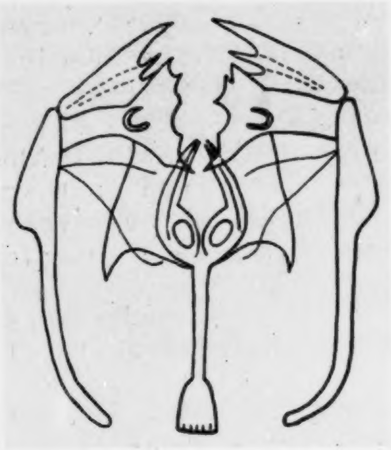
Representative Species

Proales decipiens: TL 175-250 µm; toes 12-16 µm; trophi 15 µm (length), 23 µm (width).

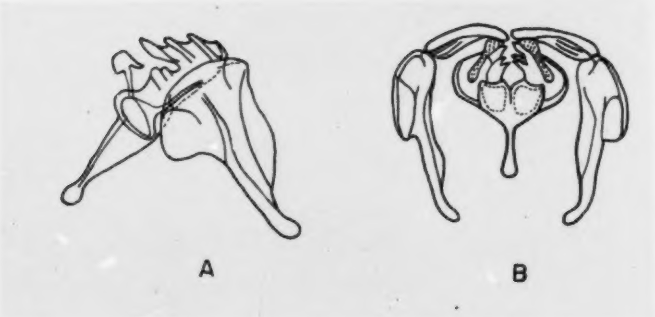
Proales sordida: TL 275-300 µm; toes 15 µm; trophi 48 µm.



Proales sp.



P. sordida trophi (redrawn from Wulfert, 1939)



P. decipiens trophi; *A*, lateral view; *B*, ventral view (redrawn from Harring and Myers, 1922)

Plate 50. *Proales* species.

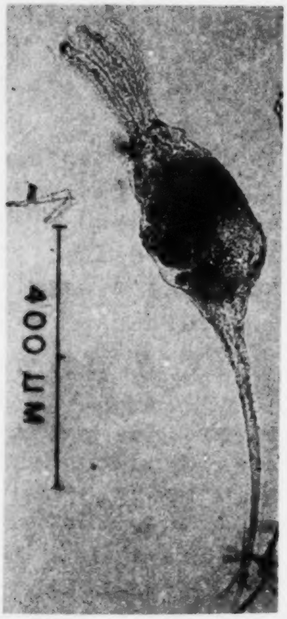
GENUS *STEPHANOCEROS* EHRENBERG 1832 (uncinate trophi)

Stephanoceros fimbriatus occasionally appears in the limnetic environment. The species is a probable component of the benthic environment as it normally lives attached to a substrate. It has been reported in the Great Lakes only during summer. This species, like *Collotheca*, feeds by trapping its prey in the bristles of the coronal lobes.

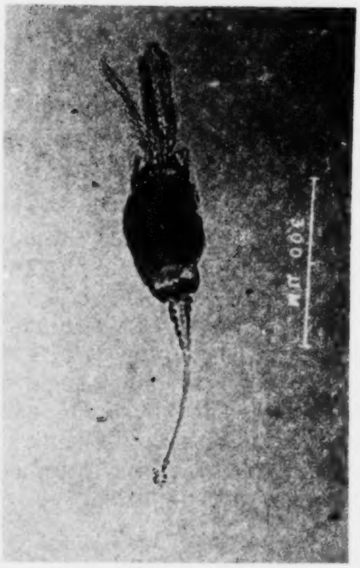
References: Berzins, 1951; Koste, 1974; and Wallace, 1977.

Most Common Species

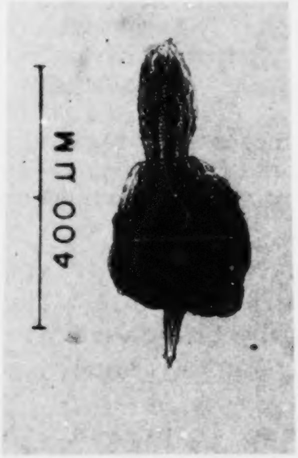
Stephanoceros fimbriatus: with five large pointed coronal lobes about as long as body, having setae arranged in spirals along length of lobes; foot long and narrow; body encased in gelatinous sheath; TL 900-1500 µm.



S. fimbriatus



S. fimbriatus



S. fimbriatus, contracted

Plate 51. *Stephanoceros fimbriatus*

GENUS *SYNCHAETA* EHRENBERG 1832 (virgate trophi)

Eight *Synchaeta* species have been recorded for the Great Lakes. Two species, *S. asymmetrica* and *S. kitina*, may have synonyms in the European literature. Although *S. kitina* is considered a synonym for *S. tremula* by Ruttner-Kolisko (1974), it is likely that *S. kitina* is a valid species based on the dentition of the uncus and small body size (Plate 56). The drawing of the species, measurements, and seasonal distribution given by Rousselet (1902) agrees with the Great Lakes form.

The cold stenothermal species *S. asymmetrica* agrees with the description of the trophi given by Koch-Althous (1963). The position of the lateral antennae, however, are not asymmetrically located as depicted in the original description. The species morphologically resembles the European species *S. verrucosa* Nipkow and *S. calva* Ruttner-Kolisko, and may be synonymous with them.

The only species reported for the Great Lakes area not recorded in recent studies is *S. longipes*. The similarity of *S. longipes* (see Rousselet, 1902) to *S. stylata* suggests that the species may be synonymous.

Most of the *Synchaeta* species display strong seasonal distribution. *Synchaeta grandis*, the largest of the Great Lakes *Synchaeta*, is an uncommon spring species. In Lake Huron it was only present in June (Stemberger et al., 1979). *Synchaeta stylata* occurs spring through fall, with maximum abundance during late spring and summer. It often co-occurs with *S. kitina* in spring. *Synchaeta kitina* may be present in the plankton from late summer through fall and sometimes displays both spring and fall maxima. *Synchaeta pectinata* is eurythermous and may be present throughout the year.

Synchaeta oblonga, a rare summer species, is present from fall through spring in inland lakes. The species usually does not co-occur with the cold stenotherm *S. lakowitziana* in inland lakes (Stemberger, unpublished).

Synchaeta lakowitziana is present throughout the year. During summer months it occurs only in the hypolimnion. It is a major *Synchaeta* species of the Great Lakes in winter. This species co-occurs with the cold stenotherm *S. asymmetrica*, which has a similar seasonal and spatial distribution and may be an indicator of oligotrophy in inland lakes (Gannon and Stemberger, 1978).

Pourriot (1977) considers *Synchaeta* a grasping species based on the virgate trophi. Some species feed on cryptomonads, chrysomonads and centric diatoms.

Additional references: Donner, 1959; Pourriot, 1965*b*; Kutikova, 1970; Ruttner-Kolisko, 1970; and Koste, 1976.

Key to Species

1 Uncus weakly developed, thin and transparent; inner margin without teeth 2
Uncus well developed; inner margin with teeth 4

2(1) Inner margin of uncus with small nuptuals; body large; a single eyespot; long foot with two pedal glands fused near toes; TL 400-600 μm: *S. grandis*
Inner margin of uncus smooth without nuptuals 3

3(2) Eye crescent-shaped; foot long and pointed with single pedal gland; foot terminates in two minute toes; TL 200-300 μm: *S. stylata*
Eye circular; foot short; apical field has two prominent antenna-like projections; inner margin of uncus with fine striations; TL 340-511 μm: *S. pectinata*

4(1) Inner margin of uncus with single rounded tooth; foot large, terminating in two small toes; outer margin of rami well defined; two eyespots clearly separated; apical field without cirri; cold stenotherm; TL 275-300 μm: *S. asymmetrica*
Uncus with six or seven teeth 5

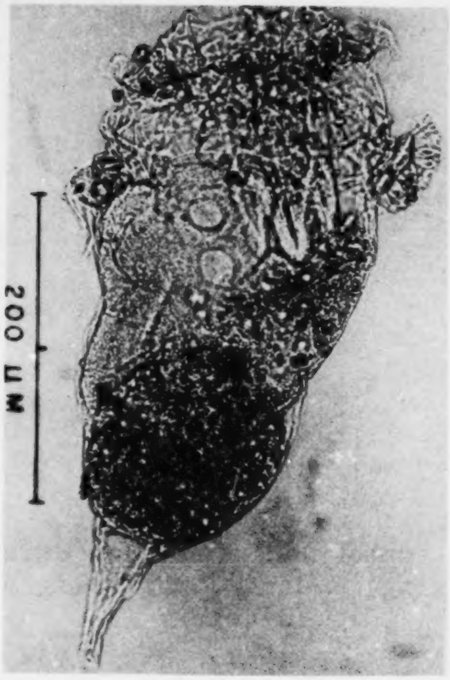
5(4) Uncus without deep indentations between teeth; eyespots separate; TL 225-300 μm: *S. lakowitziana*
Uncus with one or more deep indentations between teeth 6

6(5) Uncus highly elongate and curved with three or four deep grooves; body very small and cone-shaped; lateral antennae located at base of foot; two eyespots distinctly separate; TL 90-150 µm: *S. kitina*

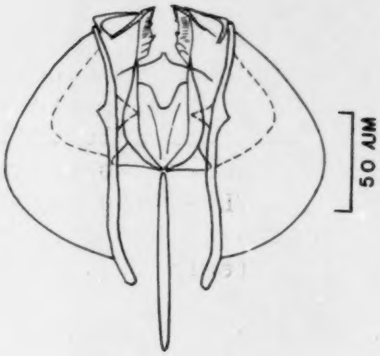
Uncus with one deep indentation or groove between teeth 7

7(6) Uncus divided into two parts by a medial cleft, with three teeth in posterior portion; eyespots separate; body cone-shaped, but swollen at sides; rounded at anterior margin; lateral antennae located in posterior third of body; TL 215-250 µm: *S. oblonga*

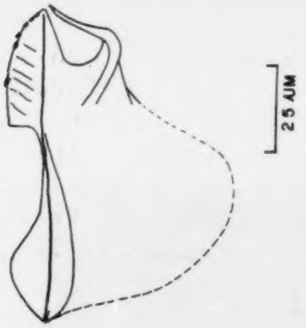
Uncus divided into two parts by a medial cleft, with two defined teeth in rounded posterior portion; eyespots distinctly separate; anterior margin of corona straight; body cone-shaped; lateral antennae located near base of foot; may attach to substrate by thin thread secreted by pedal glands; TL 175-250 µm: *S. tremula*



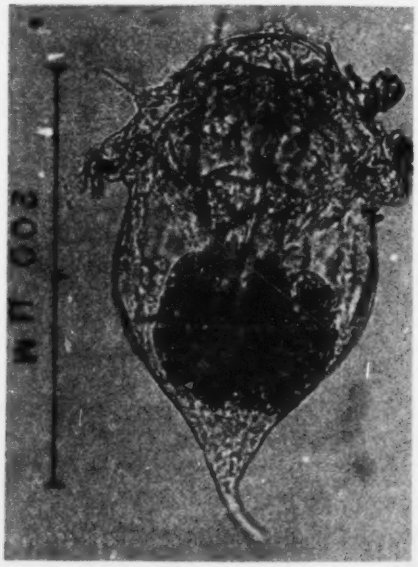
S. grandis



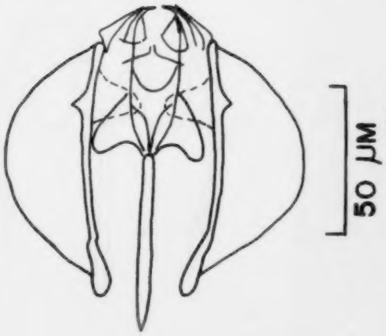
S. grandis trophi
(original drawing)



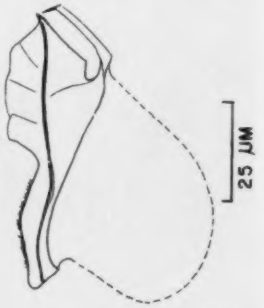
S. grandis uncus and ramus
(original drawing)



S. stylata

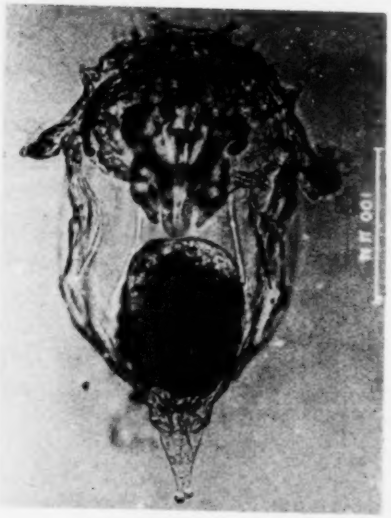


S. stylata trophi
(original drawing)

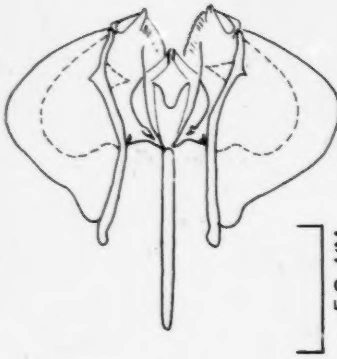


S. stylata uncus
and ramus
(original drawing)

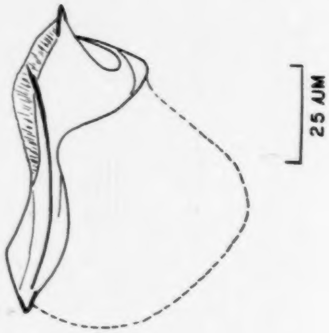
Plate 52. *Synchaeta* species.



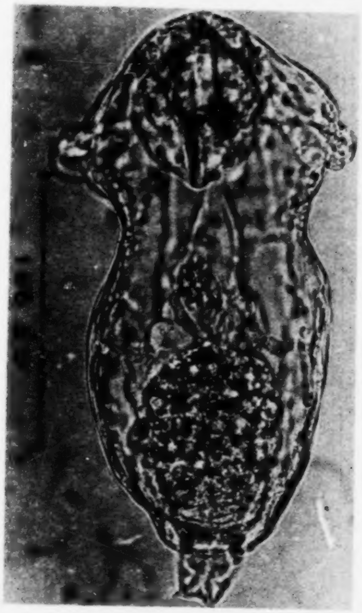
S. pectinata



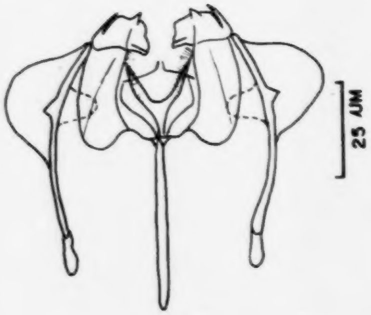
S. pectinata trophi (original drawing)



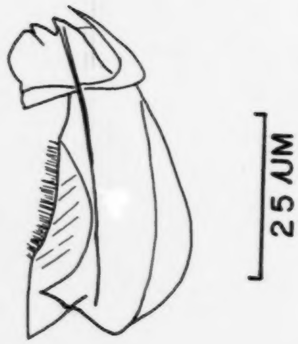
S. pectinata uncus and ramus (original drawing)



S. asymmetrica

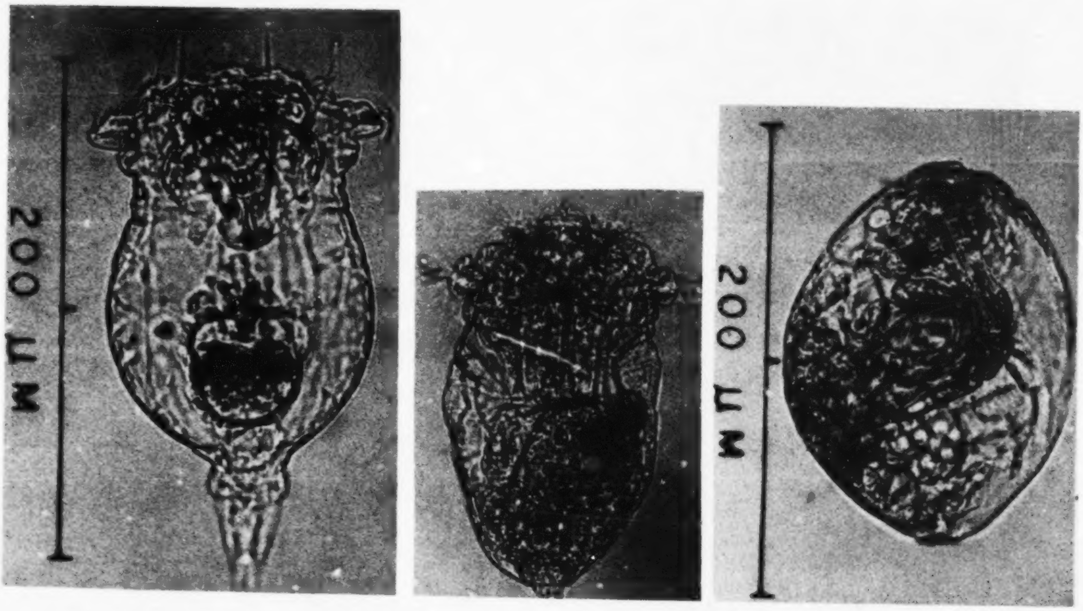


S. asymmetrica trophi (original drawing)



S. asymmetrica uncus and ramus (original drawing)

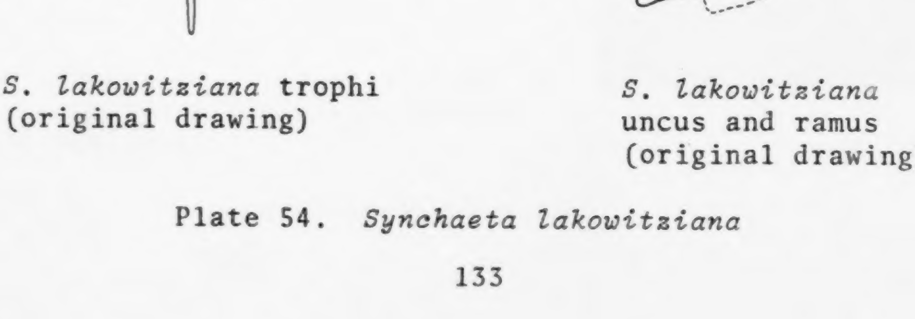
Plate 53. *Synchaeta* species.



S. lakowitziana

S. lakowitziana, foot contracted

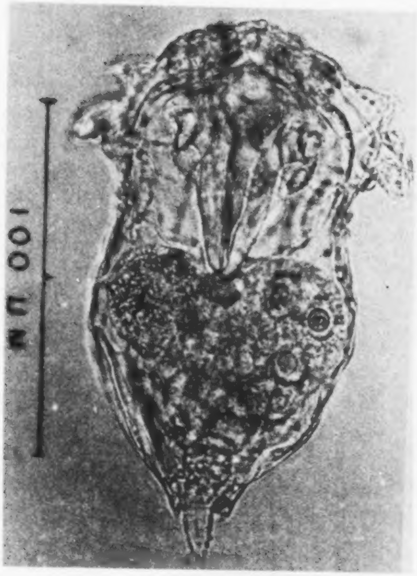
S. lakowitziana, fully contracted



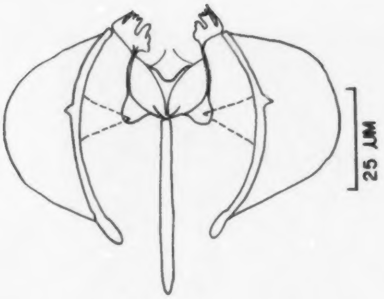
S. lakowitziana trophi (original drawing)

S. lakowitziana uncus and ramus (original drawing)

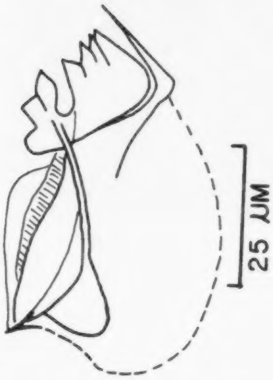
Plate 54. *Synchaeta lakowitziana*



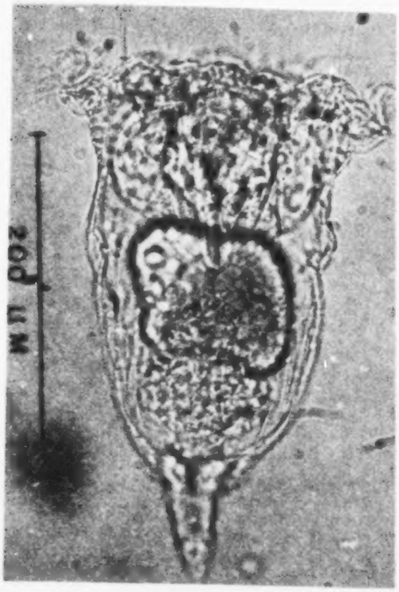
S. oblonga



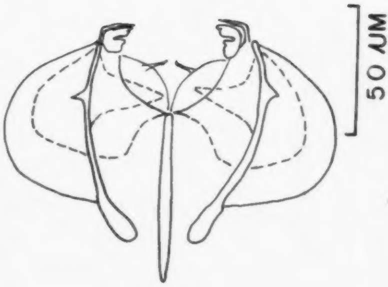
S. oblonga trophi
(original drawing)



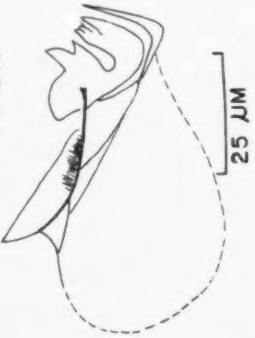
S. oblonga uncus and ramus
(original drawing)



S. tremula

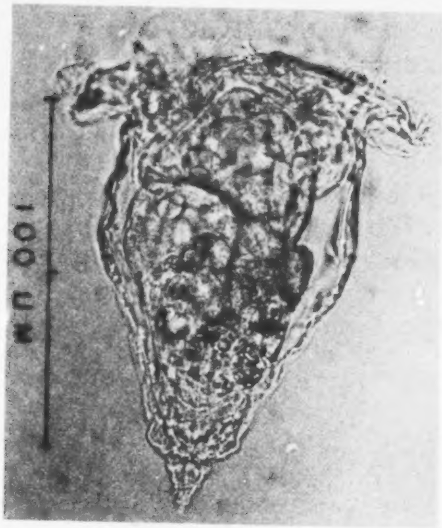


S. tremula trophi
(original drawing)

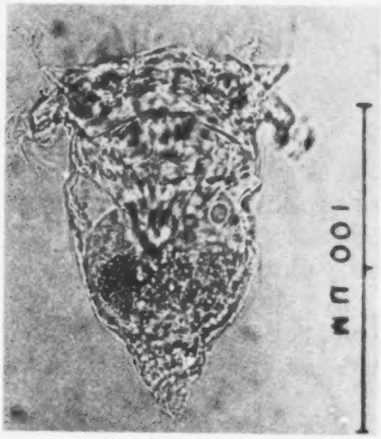


S. tremula uncus
and ramus
(original drawing)

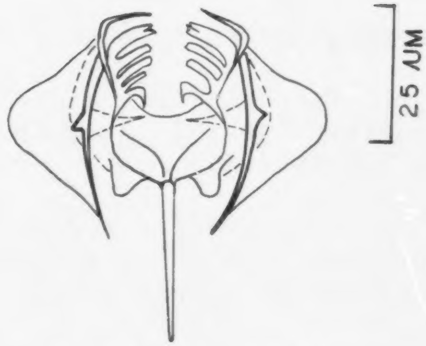
Plate 55. *Synchaeta* species.



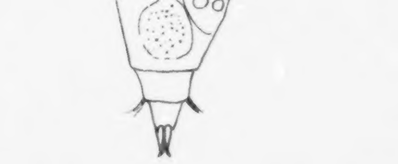
S. kitina



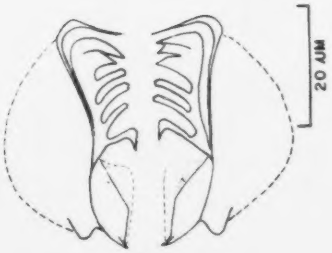
S. kitina



S. kitina trophi



S. kitina, ventral view
(original drawing)



S. kitina unci and rami
(original drawing)

Plate 56. *Synchaeta kitina*

GENUS *TESTUDINELLA* BORY DE ST. VINCENT 1826
(malleoramate trophi)

Three species of the uncommon genus *Testudinella* have been reported from the littoral areas of the Great Lakes. Some species appear highly variable and their taxonomy uncertain (cf. Voigt, 1957; Ruttner-Kolisko, 1974). Lorica size, shape, and cross-sectional view, as well as the position of the foot opening and of the lateral antennae are taxonomic characteristics used to discriminate between species. The genus is in need of revision.

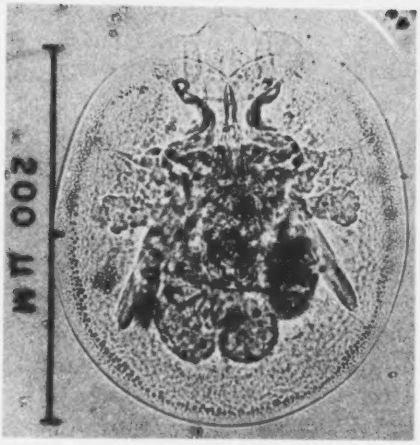
Additional references: Myers, 1934*d*, 1942; Ahlstrom, 1938; Carlin, 1939; and de Beauchamp, 1955.

Representative Species

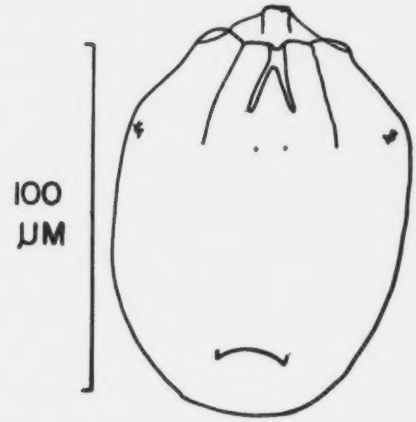
Testudinella patina f. *triloba*: foot opening medioventral; lateral antennae located on anterior third of lorica; LL 120-160 µm.

Testudinella reflexa: foot opening subterminal; lateral antennae located on anterior third of lorica; lorica trilobate in cross-sectional view; LL 115-156 µm.

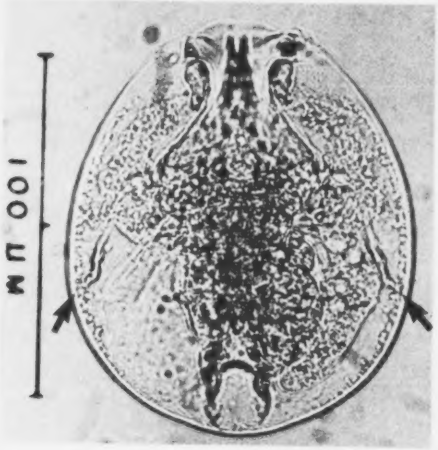
Testudinella parva: foot opening subterminal; lateral antennae located on posterior third of lorica; LL 99 µm; LW 95 µm.



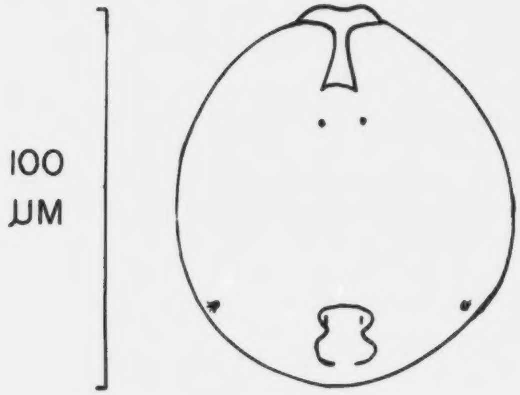
T. patina f. *triloba*



T. reflexa (redrawn from Ahlstrom, 1938)



T. parva (arrows indicate position of lateral antennae)



T. parva (redrawn from Voigt, 1957)

Plate 57. *Testudinella* species.

GENUS *TRICHOCERCA* LAMARCK 1801 (virgate trophi)

The large littoral genus *Trichocerca* has a number of species which commonly occur in the limnetic plankton. The virgate trophi and fusiform body are asymmetrical but the asymmetry of the body is not always evident unless the animal is viewed from several angles. Toes are usually unequal in length, but some species such as *Trichocerca tigris* and *T. sulcata* have two toes of equal length. The most commonly reported species in the Great Lakes are *T. multicrinis*, *T. porcellus*, *T. rousseleti*, *T. cylindrica* and *T. pusilla*. The species occur from spring through fall and display peak abundance in early summer or fall. *Trichocerca multicrinis* has been reported only for North America. *Trichocerca multicrinis*, *T. cylindrica*, and *T. pusilla* are associated with eutrophic waters but are less consistent as indicators than species of other genera such as *Brachionus* and *Anuraeopsis*.

Trichocerca show a wide range of feeding habits. *Trichocerca capucina* sucks the yolks from eggs of other rotifers (Wulfert, 1956*a*); *T. bicristata* feeds on desmids such as *Closterium* and *Staurastrum; T. insignis* prefers Chaetophorales and some Ulothricales; and *T. longiseta* prefers species of the Zygnematales (Pourriot, 1970).

Photomicrographs of *Trichocerca capucina*, *T. iernis*, *T. insolens* and *T. lophoessa* are presented on Plates 60 and 61. These species have been reported in psammon and littoral environments of the Great Lakes.

Additional references: Jennings, 1903; Wulfert, 1956*b*; and Chengalath and Mulamoottil, 1975.

Key to Species

1 With one or more anterior mucrones (spinelike projections) 2
Without anterior mucrones 7

2(1) With nine mucrones (or folds) on anterior margin; BL 85-110 µm; longest toe 30 µm: *T. rousseleti*
With single anterior mucro 3
With two anterior mucrones 4

3(2) Body ovoid; BL 180-200 μm; longest toe 90-100 μm: *T. multicrinis*

Body elongate and cylindrical; anterior projection hooked; BL 260-310 μm; toe 230-320 μm: *T. cylindrica*

4(2) With long left toe; right toe highly reduced; BL 295-330 μm; toe 140-200 μm: *T. longiseta*

Two toes visible, with shorter toe more than one-third length of longer toe 5

5(4) Mucrones long and slender of about equal length; body shaped as elongated cone; BL 215-225 μm; longest toe 50-60 μm: *T. similis*

Mucrones short, right larger than left (left mucro may be overlooked) 6

6(5) Body short and curved, thick; foot and toes usually turned beneath ventral surface of body; BL 140-150 μm; toes 50-60 μm: *T. porcellus*

Body long, slender and gently curved; shortest toe about half length of longest toe; BL 200-260 μm; longest toe 130-140 μm: *T. insignis*

7(1) Body with one or two keel-like dorsal ridges 8

Body without dorsal ridge 10

8(7) A single dorsal ridge present, extending about half length of body; BL 170-180 μm; toe 130-160 μm: *T. rattus*

Two dorsal ridges present 9

9(8) Ridges high and extending two-thirds length of body; BL 250-300 μm; longest toe 230-250 μm: *T. bicristata*

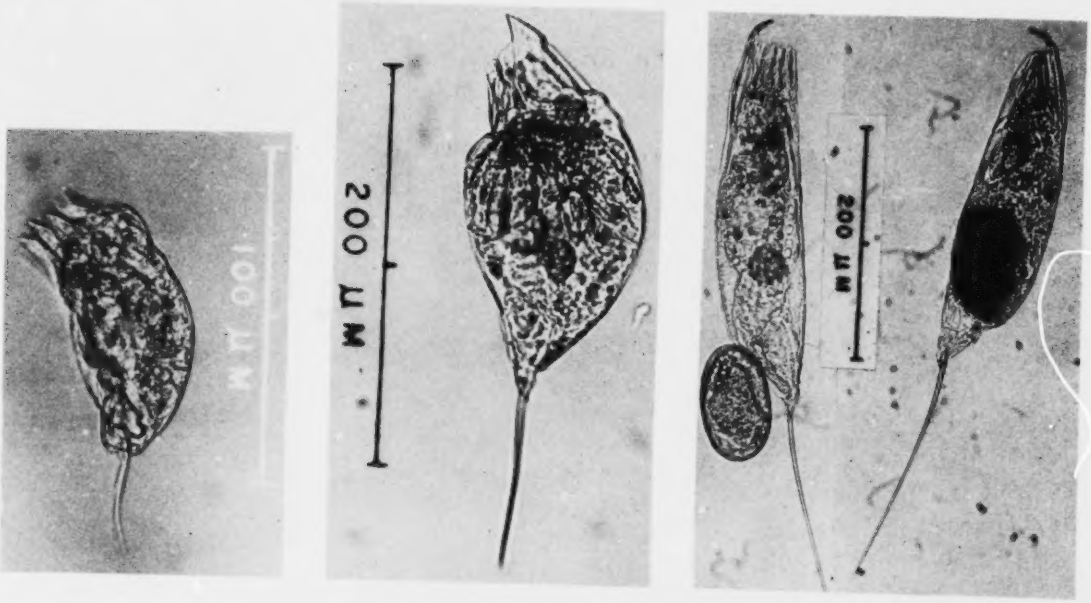
Ridges high and extending half length of body; BL 180-200 μm; longest toe 120-150 μm: *T. mucosa*

10(7) A single toe <75 μm in length; toe slightly bent near base; body stout and short; BL 85-120 μm; toe 43-63 μm: *T. pusilla*

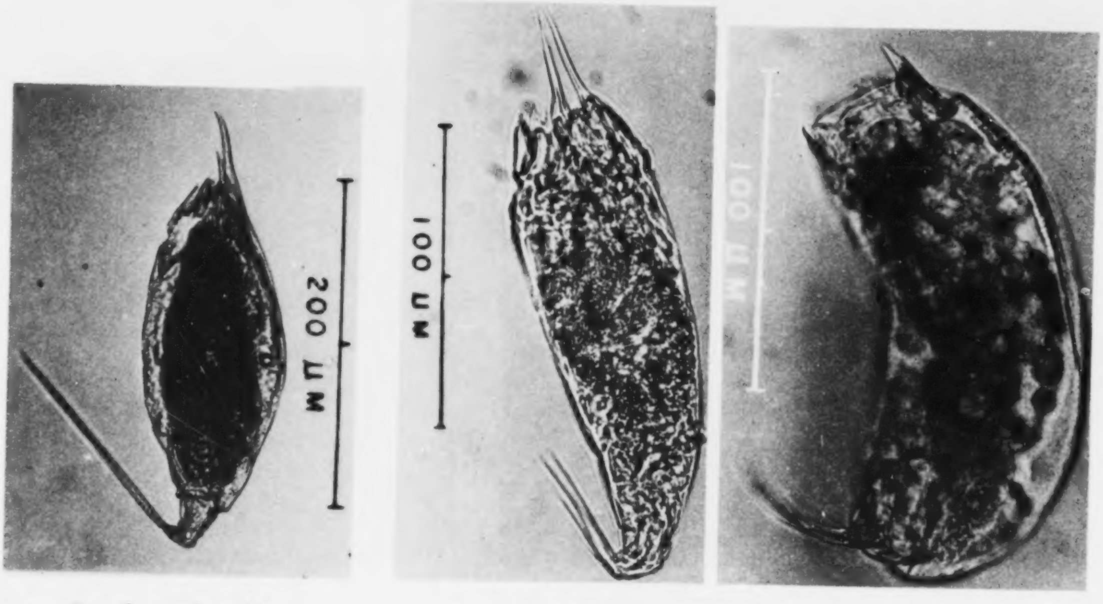
Toe(s) >100 μm in length 11

11(10) Body broadly ovate and dorsoventrally compressed; BL 155-180 µm; toe 100-120 µm: *T. lata*

Body elongate and large; smaller toe 0.16 to 0.25 length of main toe; BL 245-460 µm; main toe 210-350 µm: *T. elongata*

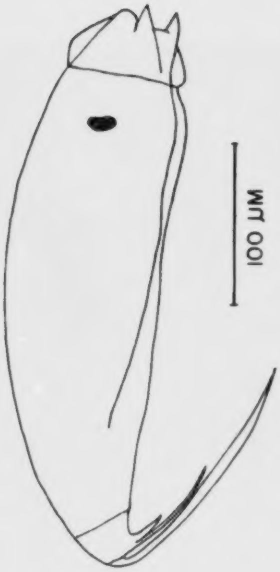

100 µM
200 µM
200 µM

T. rousseleti *T. multicrinis* *T. cylindrica*

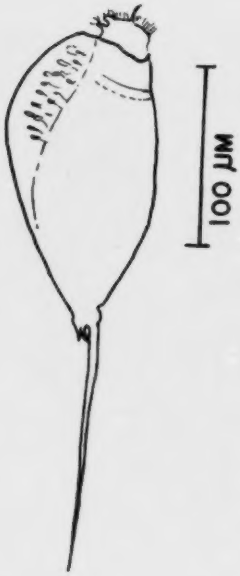

200 µM
100 µM
100 µM

T. longiseta *T. similis* *T. porcellus*

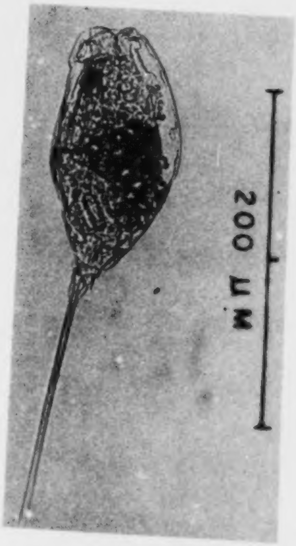
Plate 58. *Trichocerca* species.



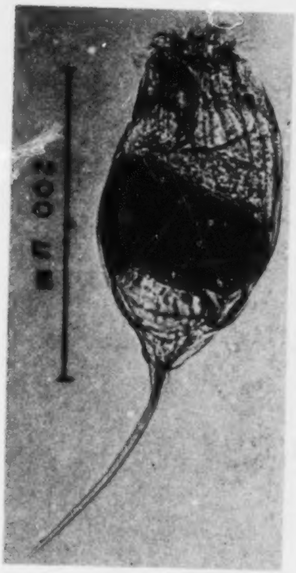
T. insignis (redrawn from Jennings, 1903)



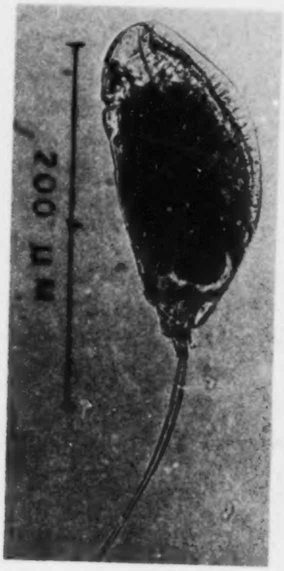
T. rattus (redrawn from Jennings, 1903)



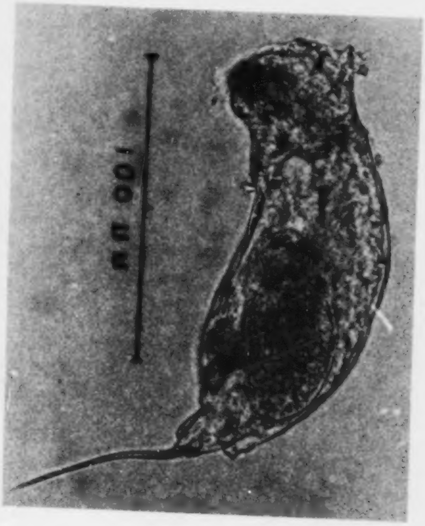
T. rattus



T. mucosa

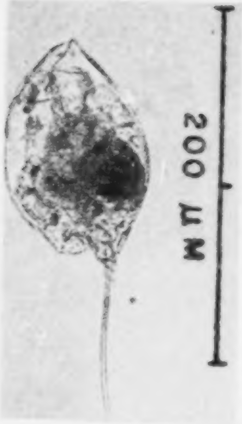


T. bicristata

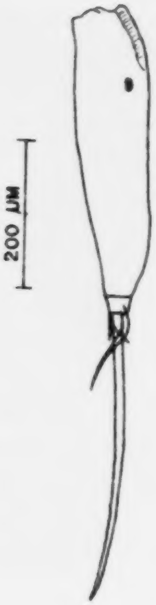


T. pusilla

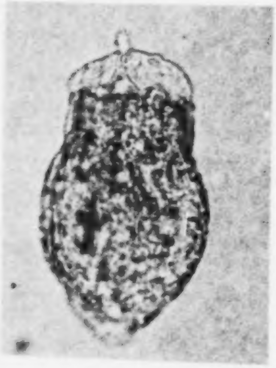
Plate 59. *Trichocerca* species.



T. lata

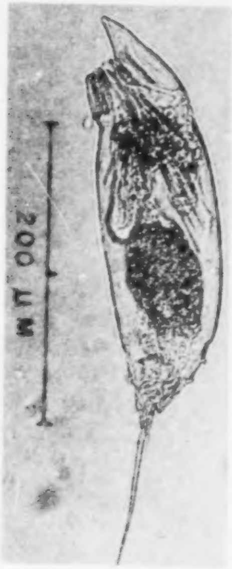


T. elongata (redrawn from Jennings, 1903)

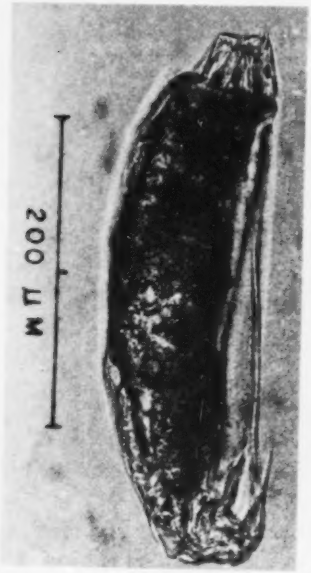


T. multicrinis male

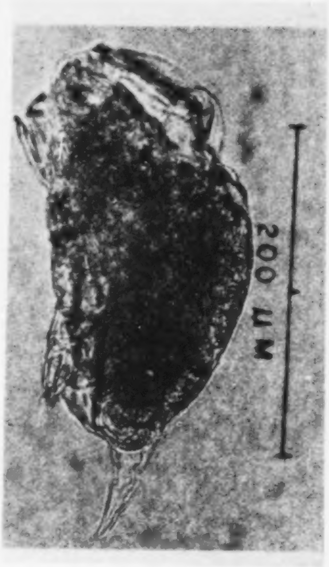
Additional Species



T. capucina

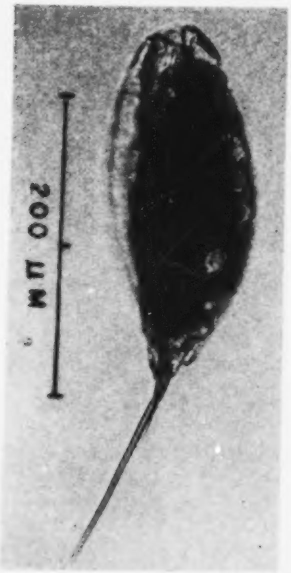


T. iernis

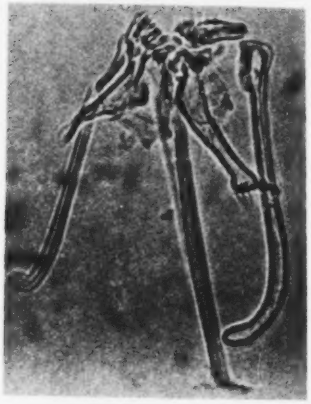


T. insolens

Plate 60. *Trichocerca* species.



T. lophoessa



T. lophoessa trophi

Plate 61. *Trichocerca lophoessa*

GENUS *TRICHOTRIA* BORY DE ST. VINCENT 1827 (malleate trophi)

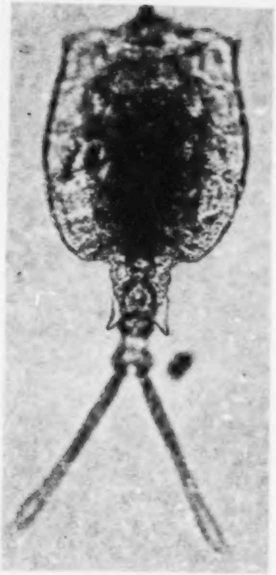
Two *Trichotria* species, *T. tetractis* and *T. pocillum*, occur in the littoral zone of the Great Lakes. The more common species *T. tetractis* is present sporadically in the plankton from spring through fall. Spines on the second foot segment are variable in length.

Reference: Wulfert, 1956*b*.

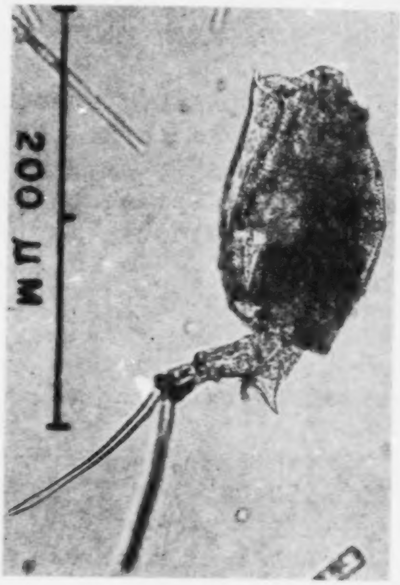
Reported Species

Trichotria pocillum: short spine located between toes; TL 200-350 µm; toe 83-145 µm.

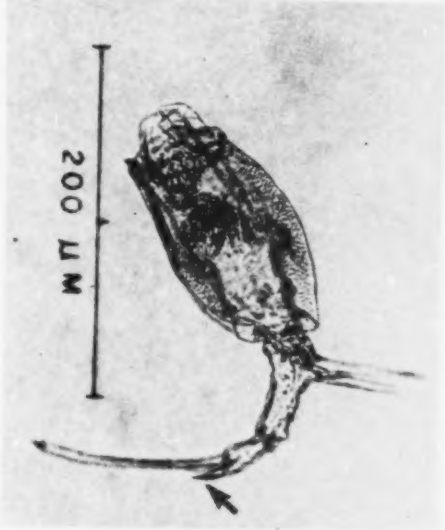
Trichotria tetractis: no spine between toes; TL 218-380 µm; toe 160 µm.



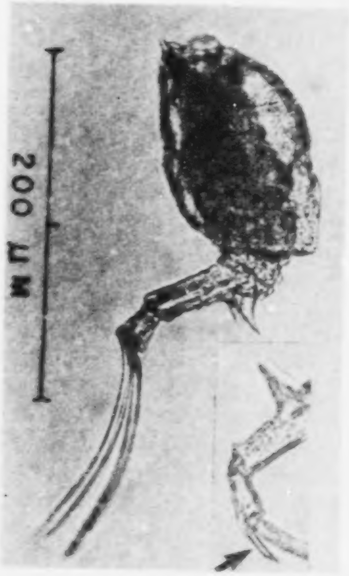
T. tetractis, dorsal view



T. tetractis, lateral view



T. pocillum, lateral view



T. pocillum, lateral view

Plate 62. *Trichotria* species.

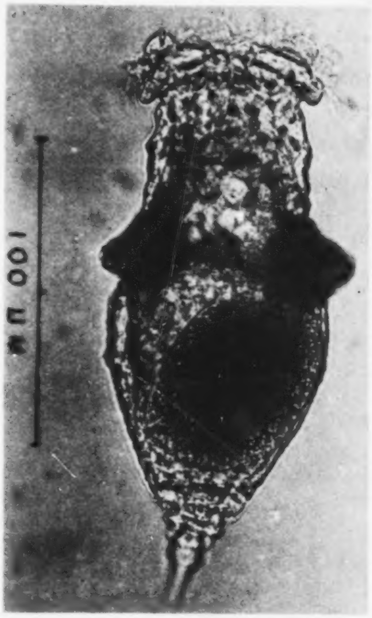
GENUS *TYLOTROCHA* HARRING AND MYERS 1922 (virgate trophi)

The genus *Tylotrocha* consists of the single species, *Tylotrocha monopus*, which has not been reported outside North America. This uncommon littoral species occasionally occurs in the limnetic environment from spring through fall. Morphologically the species resembles members of the Notommatidae, but differs in its highly modified virgate trophi and some aspects of its internal anatomy and single conical toe. Edmondson (1959) created a new family, Tylotrochidae, for the species.

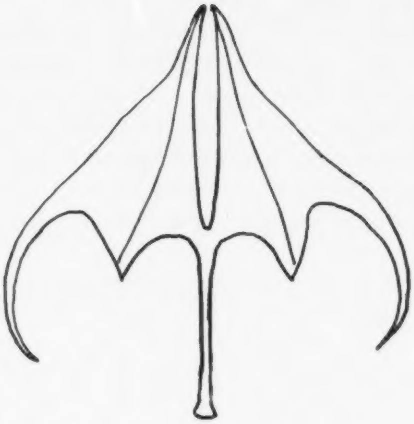
Additional reference: Harring and Myers, 1924.

Only Known Species

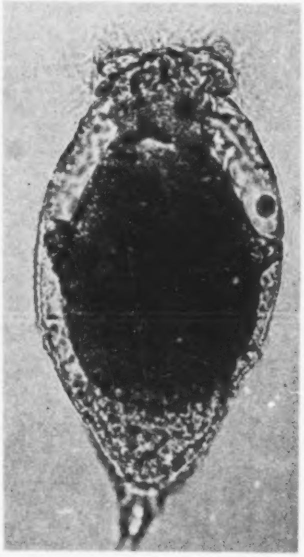
Tylotrocha monopus: body spindle-shaped; foot annulated with single conical toe; two median lateral humps present on body; specialized virgate trophi; TL 175-250 µm; toe 18-24 µm; trophi 18 µm.



T. monopus, dorsal view



T. monopus trophi (redrawn from Harring and Myers, 1924)



T. monopus, dorsal view

Plate 63. *Tylotrocha monopus*

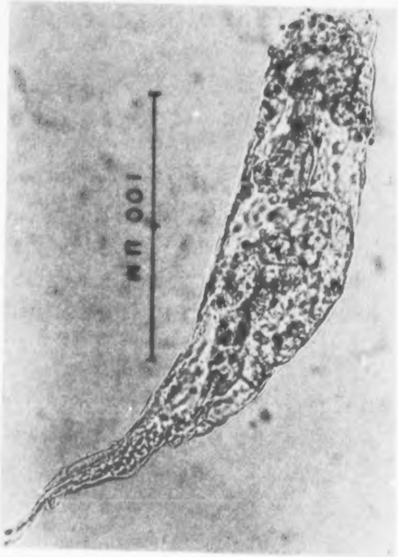
GENUS *WIERZEJSKIELLA* WISZNIEWSKI 1934 (forcipate trophi)

Wierzejskiella velox has been reported in the psammon of the Great Lakes (Seibel et al., 1973) and also in the psammon of Douglas Lake, Michigan, by Neel (1948). The genus is closely related to *Encentrum* and is distinguished from it primarily by a longer foot. The species is probably a predator. Koste (1976) reported a new form, *W. velox* f. *ricciae* (Harring, 1913), which has mouthparts that appear identical (although smaller) to *W. velox* of the Great Lakes psammon.

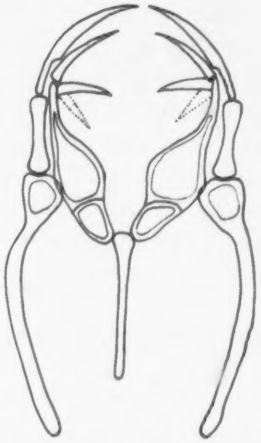
Additional reference: Voigt, 1957.

Only Reported Species

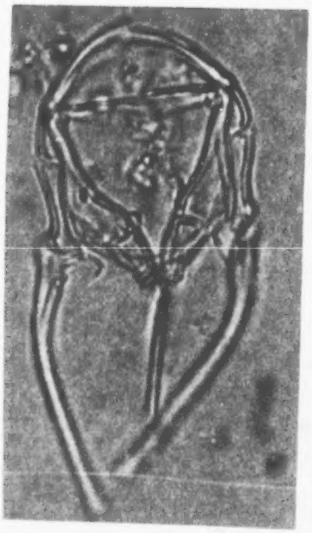
Wierzejskiella velox: TL 230-350 μm; toes 22-30 μm; trophi 30-53 μm.



W. velox



W. velox trophi
(original drawing)



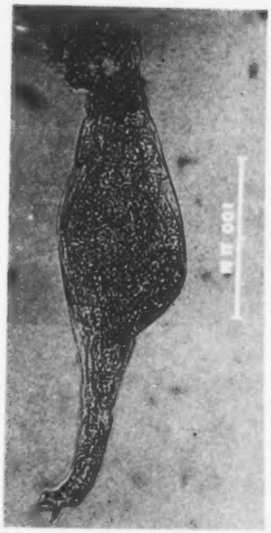
W. velox trophi

Plate 64. *Wierzejskiella velox*

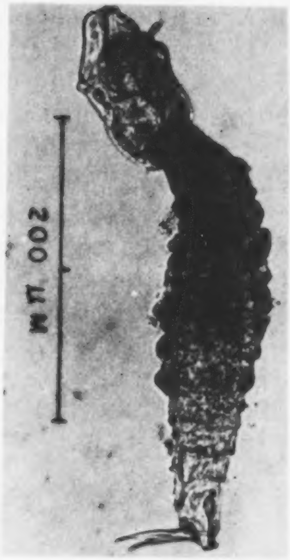
CLASS DIGONONTA (ramate trophi)

The Digononta (Bdelloidea) are among the least known of the Great Lakes rotifer groups. They commonly occur in the plankton at the outfall of rivers and may be important components of the benthic community. Members of the genera *Dissotrocha, Philodina* and *Rotaria* are among the most frequently encountered benthic species. The bdelloids may occur in the benthos throughout the year. All members of the Bdelloidea have ramate mouthparts and are strictly parthenogenetic.

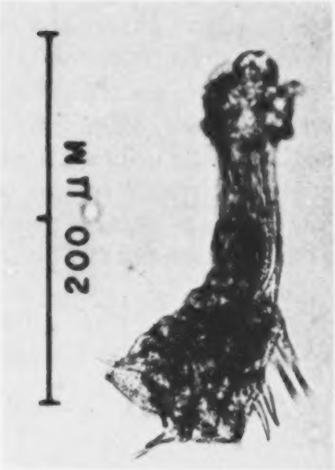
References: Burger, 1948; Pennak, 1953; Edmondson, 1959; and Donner, 1965 and 1972.



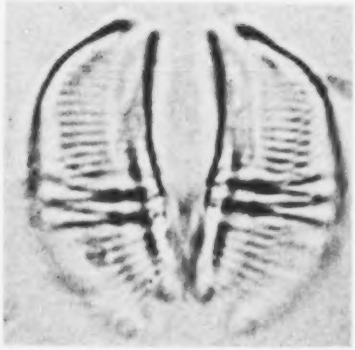
Rotaria sp. 1



Rotaria sp. 2



Macrotrachela sp.



Rotaria sp. 2, ramate trophi

Plate 65. Representative genera of the Class Digononta.

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APPENDIX A

CHECKLIST OF LAURENTIAN GREAT LAKES ROTIFERS WITH SYNONYMS

All rotifers which have been reported for the Laurentian Great Lakes are included in this checklist. Synonyms include only those cited in the Great Lakes literature. Sources for synonyms are derived from the species compilations by Harring (1913), Wisniewski (1954) and Voigt (1957).

All pertinent works on Great Lakes rotifers are listed below in chronological order. Numbers which appear after each species in the checklist refer to this list. Complete citations for these publications appear in the References section.

1. Jennings, 1894
2. Jennings, 1896
3. Kellicott, 1896
4. Kellicott, 1897
5. Jennings, 1900
6. Jennings, 1903
7. Eddy, 1927
8. Ahlstrom, 1934
9. Ahlstrom, 1936
10. Chandler, 1940
11. Davis, 1954
12. Secoy, 1962
13. Davis, 1962
14. Williams, 1966
15. Davis, 1968
16. Davis, 1969
17. Nauwerck, 1972
18. Leach, 1973
19. McNaught et al., 1973
20. Britt et al., 1973
21. Seibel et al., 1973
22. Stemberger, 1974
23. Bricker et al., 1976
24. Stemberger, 1976
25. Stemberger et al., 1979

CLASS MONOGONONTA

ORDER PLOIMA

Family Brachionidae

Subfamily Brachioninae

Anuraeopsis fissa (Gosse 1851) [8, 22, 25].
Brachionus angularis Gosse 1851 [4, 5, 8, 9, 10, 12, 15, 16, 17, 19, 22, 23, 25].
B. angularis var. *bidens* (Plate 1886) [17].
B. bidentata Anderson 1889 [23, 25].
B. budapestinensis Daday 1885 [8, 23].
B. calyciflorus Pallas 1776 = *B. pala* Ehrbg. 1832 [4, 5, 8, 13, 16-19, 21, 22, 23, 25].
B. caudatus Barrois and Daday 1894 = *B. angularis* var. *caudatus* Barrois and Daday 1894 [9, 15, 21, 22, 25].
B. havanaensis Rousselet 1911 = [?] *Schizocerca* [*Brachionus*] *diversicornis* Daday 1883 [*fide* Ahlstrom, 1940] [7, 23, 25].
B. quadridentatus Herman 1783 = *B. capsuliflorus* Pallas 1766 = *B. bakeri* Ehrbg. 1830 = *B. tuberculus* Turner 1892 = *B. tuberculatus* Turner 1892 [1, 2, 4, 5, 7, 19, 21, 23, 25].
B. rubens Ehrbg. 1838 [23].
B. urceolaris Müller 1773 [19, 22, 23, 25].
B. variabilis Hempel 1896 [25].
Epiphanes clavulata (Ehrbg. 1832) [8].
E. pelagica (Jennings 1900) = *Notops pelagicus* Jennings 1900 [5, 12].
Euchlanis alata Voronkov 1912 [8].
E. calpidia (Myers 1930) = *Dapidia calpidia* Myers 1930 [5].
E. deflexa (Gosse 1851) [1, 5, 12, 23].
E. dilatata Ehrbg. 1832 [1, 3, 5, 8, 17, 18, 19, 22, 25].
E. lyra Hudson 1886 [1].
E. meneta Myers 1930 [8].
E. oropha Gosse 1887 [1, 5, 23].
E. parva Rousselet 1892 [1, 8].
E. proxima Myers 1930 [12].
E. pyriformis Gosse 1851 [5].
E. triquetra Ehrbg. 1838 [1, 3, 5, 8, 23].
Kellicottia bostoniensis (Rousselet 1908) [17, 25].

Kellicottia longispina (Kellicott 1879) = *K. longicornis* Kellicott 1879 [*lapsus calami*] = *Notholca longispina* Hudson and Gosse 1886 [1, 2, 4, 5, 7-13, 15, 16, 18, 19, 22, 23, 25].

Keratella cochlearis cochlearis (Gosse 1851) = *Anuraea stipitata* Ehrbg. 1838 = *A. cochlearis* Gosse 1851 [1-5, 7-23, 25].

K. cochlearis f. *tecta* (Gosse 1886) = *Anuraea tecta* Gosse 1851 = *A. cochlearis* var. *tecta* Lauterborn 1898 [4, 5, 17, 19, 23, 25].

K. cochlearis var. *faluta* Ahlstrom 1943 [17].

K. cochlearis var. *hispida* (Lauterborn 1900) [17, 23, 25].

K. cochlearis var. *robusta* (Lauterborn 1900) [17, 19, 25].

K. crassa Ahlstrom 1943 [17, 19, 22, 23, 25].

K. earlinae Ahlstrom 1943 [17, 19, 22, 23, 25].

K. hiemalis Carlin 1943 [17, 19, 22, 25].

K. irregularis (Lauterborn 1900) [17, 19].

K. quadrata (Müller 1786) = *Anuraea aculeata* Ehrbg. 1832 = *K. quadrata* var. *canadensis* Berzins 1954 [1, 2, 5, 7-13, 15-23, 25].

K. serrulata (Ehrbg. 1838) = *Anuraea serrulata* Ehrbg. 1838 [1, 5].

K. taurocephala Myers 1938 [17].

K. valga (Ehrbg. 1834) [18, 22].

K. valga f. *tropica* (Apstein 1907) = *K. valga* f. *tropica-monospina* Ahlstrom 1943 [*nomen nudum*] [17].

Lophocharis oxysternon (Gosse 1851) = *Metopidia oxysternum* Hudson and Gosse 1886 [3, 8].

L. salpina (Ehrbg. 1834) = *Metopidia salpina* Hudson and Gosse 1889 [5, 25].

Macrochaetus collinsi (Gosse 1867) = *Polychaetus collinsi* Tetnetz 1892 [5, 8].

M. sericus (Thorpe 1893) = *Polychaetus serica* Jennings 1900 [4].

M. subquadratus Perty 1850 = *Polychaetus subquadratus* Perty 1852 [1, 4, 5].

Microcodides chlaena (Gosse 1886) = *Stephanops chlaena* Gosse 1886 = *Microdides orbiculodiscus* (Thorpe 1891) [*lapsus calami*] = *Microcodides dubius* Bergendal 1892 = *M. orbiculodiscus* Jennings 1894 [1, 3, 4, 5].

Mytilina macrocera (Jennings 1894) = *Salpina macrocera* Jennings 1894 [1].

M. trigona (Gosse 1851) [8].

M. ventralis (Ehrbg. 1832) = *Salpina ventralis* Ehrbg. 1832 [1, 3, 4, 8].

M. ventralis var. *brevispina* (Ehrbg. 1832) = *Salpina brevispina* Ehrbg. 1832 [1, 3, 4, 5, 8].

Notholca acuminata (Ehrbg. 1832) [13, 17, 19, 21-23, 25].
N. acuminata var. *extensa* Olofsson 1918 [17, 24].
N. caudata (Carlin 1943) [Bricker, unpublished].
N. foliacea (Ehrbg. 1838) = *Argonotholca foliacea* (Ehrbg. 1838) [*fide* Gillard, 1948] [8, 9, 17, 19, 21-25].
N. labis (Gosse 1887) [Stemberger, unpublished].
N. laurentiae Stemberger 1976 = *N. striata* (Müller 1786) = [?] *N. scapha* Gosse 1886 [2, 5, 7, 9, 10, 11, 13, 17, 21-25].
N. squamula (Müller 1786) = *N. striata* (Müller 1786) = *N. scapha* Gosse 1886 [5, 7, 17, 19, 21-25].
N. squamula "large form" [*incertae sedis*] [24].
Platyias patulus (Müller 1786) = *Brachionus patulus* Müller 1786 = *B. militaris* Ehrbg. 1834 [1, 3, 4, 5, 8, 12, 22, 23, 25].
P. quadricornis (Ehrbg. 1832) = *Noteus quadricornis* Ehrbg. 1832 [1, 3, 4, 5, 8, 22, 25].
Trichotria pocillum (Müller 1776) = *Dinocharis pocillum* Ehrbg. 1830 [1, 4, 5, 8].
T. tetractis (Ehrbg. 1830) = *Dinocharis tetractis* Ehrbg. 1830 [1, 2, 5, 7, 8, 9, 18, 23, 25].
Wolga spinifera (Western 1894) = *Trichotria spinifera* (Western 1894) = *Distyla spinifera* Western 1894 [4, 8].

Subfamily Colurinae

Colurella bicuspidata (Ehrbg. 1832) [8].
C. obtusa (Gosse 1886) = *Colurus obtusus* Gosse 1886 [5, 8].
C. uncinata f. *bicuspidata* (Ehrbg. 1832) = *Colurus bicuspidatus* Ehrbg. 1832 [1, 5].
C. uncinata f. *deflexa* (Ehrbg. 1834) = *Colurus deflexus* Ehrbg. 1834 [3, 5, 8].
Lepadella acuminata (Ehrbg. 1834) = *Metopidia acuminata* Ehrbg. 1834 [1, 5, 8].
L. apsida Harring 1916 [8].
L. ehrenbergi (Perty 1850) = *Notogonia ehrenbergi* Perty 1850 = *Metopidia ehrenbergi* Jennings 1894 [1, 4, 5].
L. ovalis (Müller 1786) = *Metopidia lepadella* Ehrbg. 1832 = *M. solidus* Gosse 1851 [1, 3, 4, 5, 7].
L. patella (Müller 1773) = *Metopidia bractea* Hudson and Gosse 1886 [1, 5, 8, 9, 23, 25].
L. rhomboides (Gosse 1886) = *Metopidia rhomboides* Gosse 1886 [1, 5, 8].
L. triptera (Ehrbg. 1830) = *Metopidia triptera* Ehrbg. 1830 [1, 5, 8].

Squatinella mutica (Ehrbg. 1832) = *Stephanops muticus* Ehrbg. 1832 [1, 4, 5, 8].
S. rostrum (Schmarda 1846) = *Stephanops lamellaris* Ehrbg. 1830 [3, 5].

Family Lecanidae

Lecane arcula Harring 1914 [8].
L. crepida Harring 1914 = *Distyla gissensis* Jennings 1900 [*fide* Eckstein, 1883] [5, 8].
L. curvicornis (Murray 1913) [8].
L. flexilis (Gosse 1886) = *Distyla flexilis* Gosse 1886 [5, 8, 25].
L. hastata (Murray 1913) [8].
L. inermis (Bryce 1892) [Stemberger, unpublished].
L. leontina (Turner 1892) = *Cathypna leontina* Turner 1892 [1, 4, 5].
L. ludwigi (Eckstein 1883) = *Distyla ludwigi* Eckstein 1883 [1, 5, 8].
L. luna (Müller 1776) = *Cathypna luna* Gosse 1886 [1, 3, 5, 8, 9, 12, 23, 25].
L. mucronata Harring and Myers 1926 [25].
L. ohioensis (Herrick 1885) = *Distyla ohioensis* Herrick 1885 [3, 4, 5, 8].
L. stokesi (Pell 1890) = *Distyla stokesi* Pell 1890 [1, 5].
L. tenuiseta Harring 1914 [8].
L. tudicola Harring and Myers 1926 [8].
L. ungulata (Gosse 1887) = *Cathypna ungulata* Gosse 1887 [1, 5, 8, 12].
Monostyla bulla Gosse 1851 [1, 3, 5, 8, 23].
M. closterocerca Schmarda 1859 [1, 2, 5, 8, 25].
M. copeis Harring and Myers 1926 [8].
M. cornuta (Müller 1786) [1, 5, 8].
M. hamata Stokes 1896 [8].
M. lunaris (Ehrbg. 1832) [1, 3, 5, 8, 9, 12, 23, 25].
M. obtusa Murray 1913 [25].
M. pyriformis Daday 1905 [12].
M. quadridentata Ehrbg. 1832 [1, 3, 5, 8, 23].
M. rhopalura Harring and Myers 1926 [12].
M. rugosa Harring 1914 [8].
M. stenroosi Meissner 1908 [8].

Family Proalidae

Proales decipiens (Ehrbg. 1832) [5, 8].
P. parasita (Ehrbg. 1838) [8].
P. sordida (Gosse 1887) [1, 5].
P. wernecki (Ehrbg. 1834) [1, 5].

Family Notommatidae

Cephalodella auriculata (Müller 1773) = *Notommata lacinulata* Ehrbg. 1830 = *Proales gibba* Gosse 1886 = *Diaschiza lacinulata* Levander 1894 [1, 3, 4, 5, 8].
C. catellina (Müller 1786) = *Diglena catellina* Ehrbg. 1830 [5].
C. crassipes (Lord 1903) [8].
C. forficula (Ehrbg. 1832) = *Furcularia forficula* Ehrbg. 1838 [1, 5, 8].
C. gibba (Ehrbg. 1832) = *Furcularia gibba* Ehrbg. 1832 = *Diaschiza semiaptera* Gosse 1886 [1, 5, 8, 9, 10, 23, 25].
C. gracilis (Ehrbg. 1832) = *Furcularia gracilis* Ehrbg. 1832 [1, 8].
C. megalocephala (Glasscott 1893) [12].
C. parasitica (Jennings 1900) = *Pleurotrocha parasitica* Jennings 1900 [5].
C. rotunda Wulfert 1937 [12].
Itura aurita (Ehrbg. 1830) = *Eosphora aurita* Gosse 1856 [1, 4, 5].
Monommata grandis (Tessin 1890) [8].
M. longiseta (Müller 1786) = *Furcularia longiseta* Lamarck 1816 [1, 3, 4, 5, 8].
Notommata aurita (Müller 1786) [1, 3, 5].
N. brachyota Ehrbg. 1832 [1, 5].
N. cerberus (Gosse 1886) = *Copeus cerberus* Gosse 1886 [1, 5].
N. collaris Ehrbg. 1832 [1, 5].
N. copeus Ehrbg. 1834 = *Copeus ehrenbergi* Gosse 1886 = *C. labiatus* Hudson and Gosse 1886 [1, 4, 5].
N. cyrtopus Gosse 1886 [8].
N. lenis Harring and Myers 1922 [8].
N. pachyura (Gosse 1886) = *Copeus pachyurus* Gosse 1886 [5].
N. tripus Ehrbg. 1838 [1, 5].
Pleurotrocha petromyzon Ehrbg. 1830 = *Notops laurentinus* Jennings 1894 = *Proales laurentinus* Jennings 1896 [1, 5].

Scaridium longicaudum (Müller 1786) [1, 3, 5, 8].
Taphrocampa annulosa Gosse 1851 [1, 2, 5, 8].
T. selenura Gosse 1887 [1, 5, 8].

Family Lindidae

Lindia torulosa Dujardin 1841 = ?*Notommata vorax* Stokes 1697 [*fide* Wisniewski, 1954] = *N. torulosa* Eyferth 1878 [1, 4, 5].
L. truncata (Jennings 1894) = *Notommata truncata* Jennings 1894 [5].

Family Trichocercidae

Ascomorphella volvocicola (Plate 1886) = *Hertwigia volvocicola* Plate 1886 = *H. parasita* Hood 1895 [4, 5, 12].
Trichocerca bicristata (Gosse 1887) = *Mastigocerca bicristata* Gosse 1887 = *Rattulus bicristatus* Jennings 1903 [4, 5, 6, 8].
T. bicuspes (Pell 1890) = *Mastigocerca bicuspes* Pell 1890 = *Rattulus bicuspes* Jennings 1903 [1, 5, 6].
T. brachyura (Gosse 1851) = *Coelopus brachyurus* Gosse 1886 = *Diurella brachyura* Jennings 1903 [5, 6, 8].
T. capucina (Wierzejski and Zacharias 1893) = *Mastigocerca capucina* Wierzejski and Zacharias 1893 = *Rattulus capucinus* Jennings 1903 [1, 5, 6].
T. cylindrica (Imhof 1891) = *Rattulus cylindricus* Jennings 1903 [6, 7, 17, 18, 23, 25].
T. elongata (Gosse 1886) = *Mastigocerca elongata* Gosse 1886 = *Rattulus elongatus* Jennings 1903 [4, 5, 6, 8].
T. gracilis (Tessin 1890) = *Rattulus gracilis* Jennings 1903 [6].
T. iernis (Gosse 1887) = *Rattulus gracilis* Jennings 1903 [6].
T. insignis (Herrick 1885) = *Diurella insignis* Herrick 1885 [6, 8].
T. insolens (Myers 1936) [21].
T. lata (Jennings 1894) = *Mastigocerca lata* Jennings 1894 = *Rattulus latus* Jennings 1903 [1, 3, 4, 5, 8, 23].
T. longiseta (Schrank 1802) = *Mastigocerca bicornis* Hudson and Gosse 1886 = *Rattulus longiseta* Jennings 1903 [1-6, 8, 10].

Trichocerca lophoessa (Gosse 1886) [12].
T. macera (Gosse 1886) = *Rattulus macerus* Jennings 1903 [6].
T. mucosa (Stokes 1896) = *Mastigocerca mucosa* Stokes 1896 = *Rattulus mucosus* Jennings 1903 [5, 6, 8, 23, 25].
T. multicrinis (Kellicott 1897) = *Mastigocerca multicrinis* Kellicott 1897 = *Rattulus multicrinis* Jennings 1903 [4, 5, 6, 8, 17, 18, 19, 22, 23, 25].
T. porcellus (Gosse 1851) = *Coelopus porcellus* Gosse 1886 = *Diurella porcellus* Jennings 1903 [1, 3, 5, 6, 8, 9, 17, 22, 23, 25].
T. pusilla (Jennings 1903) = *Rattulus pusillus* Jennings 1903 [6, 8, 9, 12, 23, 25].
T. rattus (Müller 1776) = *Rattulus carinatus* Lamarck 1816 = *Mastigocerca carinata* Ehrbg. 1830 = *M. rattus* Hudson and Gosse 1886 = *Rattulus rattus* Jennings 1903 [1-6, 8, 12].
T. rousseleti (Voigt 1902) = *Diurella rousseleti* Jennings 1903 [6, 9, 22, 23, 25].
T. scipio (Gosse 1886) = *Rattulus scipio* Jennings 1903 [6].
T. similis (Wierzejski 1893) = *Diurella stylata* Eyferth 1878 [6, 8, 23, 25].
T. stylata (Gosse 1851) [23].
T. sulcata (Jennings 1894) = *Rattulus sulcatus* Jennings 1894 = *Diurella sulcata* Jennings 1903 [1, 3, 4, 6, 9].
T. tenuior (Gosse 1886) = *Coelopus tenuior* Hudson and Gosse 1886 = *Diurella tenuior* Jennings 1903 [3, 4, 6, 12].
T. tigris (Müller 1786) = *Diurella tigris* Bory de St. Vincent 1824 = *Rattulus tigris* Gosse 1886 [5, 6, 8].
T. weberi (Jennings 1903) = *Diurella weberi* Jennings 1903 [6, 8].

Family Gastropidae

Ascomorpha ecaudis Perty 1850 [1, 2, 5, 12, 21].
A. ovalis (Bergendal 1892) = *Chromogaster ovalis* (Bergendal 1892) = *Anapus ovalis* Bergendal 1892 = [?] *Chromogaster testudo* Lauterborn 1893 [1, 2, 5, 9, 10, 12, 18, 20, 21, 22, 23, 25].
A. saltans Bartsch 1870 = [?] *A. hyalina* Jennings 1901 [1, 5, 25].
Gastropus hyptopus (Ehrbg. 1838) [Stemberger, unpublished].
G. minor (Rousselet 1872) = *Notops minor* Rousselet 1892 [4, 5].

Gastropus stylifer Imhof 1891 = *Notops pygmaeus* Calman 1892 = *Sacculus orbicularis* Kellicott 1897 = *Ascomorpha orbicularis* Jennings 1901 [1, 2, 4, 5, 8, 9, 10, 17, 18, 22, 23, 25].

Family Dicranophoridae

Albertia naidis Bousfield 1886 [1].
Aspelta aper (Harring 1913) [8].
Dicranophorus caudatus (Ehrbg. 1834) = *Diglena biraphis* Gosse 1851 [1, 5, 8].
D. forcipatus (Müller 1786) = *Diglena forcipata* Ehrbg. 1832 [1, 4, 5, 12].
D. grandis (Ehrbg. 1832) = *Diglena grandis* Ehrbg. 1832 [1, 5].
D. mesotis Harring and Myers 1928 [12].
D. tegillus Harring and Myers 1928 [8, 12].
Encentrum felis (Müller 1773) = *Proales felis* Hudson and Gosse 1886 [1, 5].
E. saundersiae (Hudson 1885) = *Taphrocampa saundersiae* Hudson 1885 [1, 5].
Wierzejskiella velox (Wiszniewski 1932) [21].

Family Tylotrochidae

Tylotrocha monopus (Jennings 1894) = *Notommata monopus* Jennings 1894 [1, 2, 8, 9, 23, 25].

Family Asplanchnidae

Asplanchna brightwelli Gosse 1850 [25].
A. herricki de Guerne 1888 [1, 2, 5, 8, 9, 10, 23, 25].
A. priodonta Gosse 1850 [1, 2, 4, 5, 7-10, 12. 17, 18, 19, 22, 23, 25].
Asplanchnopus multiceps (Schrank 1793) = *A. myrmyleo* Hudson and Gosse 1889 [3, 4, 5].

Family Synchaetidae

Ploesoma hudsoni (Imhof 1891) [1, 2, 5, 17, 23, 25].
P. lenticulare Herrick 1885 = *P. lynceus* Jennings 1894 [1, 2, 3, 5, 8, 22, 23, 25].

Ploesoma truncatum (Levander 1894) = *P. truncata* (Levander 1894) [4, 5, 8, 9, 10, 17, 18, 19, 21, 22, 23, 25].
Polyarthra dissimulans Nipkow 1952 [19].
P. dolichoptera Idelson 1925 [17. 19, 22, 25].
P. euryptera Wierzejski 1893 [8, 9, 10, 12, 19, 23, 25].
P. longiremis Carlin 1943 [12, 19].
P. major Burckhardt 1900 [12, 17, 19, 22, 23, 25].
P. remata Skorikov 1896 [17, 19, 21, 22, 23, 25].
P. vulgaris Carlin 1943 = *P. trigla* Ehrbg. 1834 = *P. platyptera* Ehrbg. 1838 [1, 2, 3, 5, 7-10, 12, 16-19, 22, 23, 25].
Synchaeta asymmetrica [?] Koch-Althaus 1963 [22, 25].
S. grandis Zacharias 1893 [22, 25].
S. kitina Rousselet 1902 = *Synchaeta* sp. [22, 23, 25].
S. lakowitziana Lucks 1930 [17, 19, 22, 25].
S. oblonga Ehrbg. 1832 [22, 25].
S. pectinata Ehrbg. 1832 [1, 4, 5, 8, 12, 17, 19, 22, 25].
S. stylata Wierzejski 1893 [1, 2, 4, 5, 7-10, 15, 16, 17, 19, 21, 22, 23, 25].
S. tremula (Müller 1786) [3, 5, 7, 22].

ORDER FLOSCULARIACEA

Family Testudinellidae

Filinia brachiata (Rousselet 1901) [8,22].
F. longiseta (Ehrbg. 1834) = *Triarthra longiseta* Ehrbg. 1834 [3, 5, 8-13, 15-19, 21, 22, 23, 25].
F. terminalis (Plate 1886) [25].
Pompholyx sulcata Hudson 1885 [17, 22, 23, 25].
Testudinella parva (Ternetz 1892) = *Pterodina bidentata* Ternetz 1892 = *P. emarginata* Wierzejski 1893 [1].
T. patina (Hermann 1783) = *Pterodina patina* Ehrbg. 1830 [1, 3, 4, 5, 8, 12, 23].
T. reflexa (Gosse 1887) = *Pterodina reflexa* Gosse 1887 [1, 3, 4, 5].
Trochosphaera solstitialis Thorpe 1893 [8].

Family Hexarthridae

Hexarthra mira (Hudson 1871) = *Pedalia mira* Hudson 1871 = *Pedalion mirum* Hudson 1886 [4, 5, 8, 20, 23].

Family Flosculariidae

Beauchampia crucigera (Dutrochet 1812) = *Cephalosiphon limnias* Gosse 1862 [1, 3, 4, 5].
Floscularia conifera (Hudson 1886) = *Melicerta conifera* Hudson 1886 [3, 5].
F. janus (Hudson 1881) = *Melicerta janus* Hudson and Gosse 1886 = *M. flocculosa* Kellicott 1896 [1, 3, 5].
F. melicerta (Ehrbg. 1832) = *Melicerta tubicolaria* Hudson and Gosse 1886 [4, 5].
F. ringens (Linnaeus 1758) = *Melicerta ringens* Schrank 1803 [1, 4, 5].
Lacinularia flosculosa (Müller 1773) = *L. socialis* Ehrbg. 1830 [3, 5].
Limnias ceratophylli Schrank 1803 [3, 5].
L. melicerta Weisse 1848 = *L. annulatus* Bailey 1855 [3, 5].
L. shiawasseensis Kellicott 1888 [3, 5].
Ptygura crystallina (Ehrbg. 1834) = *Oecistes crystallinus* Ehrbg. 1834 [3, 5].
P. longicornis (Davis 1867) = *Oecistes longicornis* Davis 1867 [1, 3, 5].
P. longipes (Willis 1878) = *Oecistes umbella* Hudson 1879 [4, 5].
P. melicerta (Ehrbg. 1832) = *Oecistes ptygura* Hudson and Gosse 1886 = *O. melicerta* Jennings 1900 [1, 5].
P. melicerta var. *mucicola* (Kellicott 1888) = *Oecistes mucicola* Kellicott 1888 [3, 5].
Sinantherina socialis (Linnaeus 1758) = *Megalotrocha alboflavicans* Ehrbg. 1838 [1, 3, 5].

Family Conochilidae

Conochiloides dossuarius (Hudson 1885) [4, 5, 7, 8, 23, 25].
Conochilus hippocrepis (Schrank 1803) = *C. volvox* Ehrbg. 1834 [1, 3, 5, 9].
C. unicornis Rousselet 1892 = *C. leptopus* Forbes 1893 [1, 2, 4, 5, 8-13, 15, 17, 19, 22, 23, 25].

ORDER COLLOTHECACEAE

Family Collothecidae

Collotheca algicola (Hudson 1886) = *Floscularia algicola* Hudson 1886 [5].
C. ambigua (Hudson 1883) = *Floscularia ambigua* Hudson 1883 [3, 5].
C. campanulata (Dobie 1849) = *Floscularia campanulata* Dobie 1849 [1, 3, 5].
C. cornuta (Dobie 1849) = *Floscularia cornuta* Dobie 1849 [1, 3, 5].
C. edentata (Collins 1872) = *Floscularia edentata* Collins 1872 [1, 4, 5].
C. mutabilis (Hudson 1885) = *Floscularia mutabilis* Hudson 1885 [1, 2, 3, 5, 8, 9, 10, 17, 18, 19, 22, 23, 25].
C. ornata (Ehrbg. 1832) = *Floscularia ornata* Ehrbg. 1832 [1, 3, 5].
C. pelagica (Rousselet 1893) = *Floscularia pelagica* Rousselet 1893 [1, 2, 5, 22, 25].
Cupelopagis vorax (Leidy 1857) = *Apsilus lentiformis* Metchnikov 1866 = *A. bipera* Foulke 1884 [3, 4, 5].
Stephanoceros fimbriatus (Goldfuss 1820) = *S. eichhorni* Ehrbg. 1832 [1, 4, 5, 9, 25].
S. millsi (Kellicott 1885) = *Floscularia millsi* Kellicott 1885 [1, 3, 5].

CLASS DIGONONTA (BDELLOIDEA)

ORDER BDELLOIDA

Family Philodinidae

Dissotrocha aculeata (Ehrbg. 1832) = *Philodina aculeata* Ehrbg. 1832 [1, 3, 8, 12].
D. macrostyla (Ehrbg. 1838) = *Philodina macrostyla* Ehrbg. 1838 [1, 2, 8].
Macrotrachela musculosa Milne 1886 = *Callidina musculosa* Janson 1893 [1, 2, 5].
Philodina citrina Ehrbg. 1832 [1, 3, 5, 8].
P. inopinata Milne 1916 [12].
P. megalotrocha Ehrbg. 1832 [1, 3, 5, 8].
P. roseola Ehrbg. 1832 [1, 3, 5, 8, 12].
Rotaria elongata (Weber 1888) = *Rotifer elongatus* Weber 1888 [2, 5].

Rotaria macroceros (Gosse 1851) = *Rotifer macroceros* Gosse 1851 [1, 3, 5].
R. macrura (Ehrbg. 1832) = *Rotifer macrurus* Ehrbg. 1832 [3, 5].
R. mento (Anderson 1889) = *Rotifer mento* Anderson 1889 [1, 5].
R. neptunia (Ehrbg. 1832) = *Rotifer neptunius* Ehrbg. 1832 = *Rotifer actinurus* Janson 1893 [1, 5, 8].
R. rotatoria (Pallas 1766) = *Rotifer vulgaris* Schrank 1801 [1, 3, 5, 8].
R. tardigrada (Ehrbg. 1832) = *Rotifer tardus* Ehrbg. 1838 [1, 3, 5, 8].
R. trisecata (Weber 1888) = *Rotifer trisecatus* Weber 1888 [1, 5].

DOUBTFUL SPECIES

Brachionus urceus (Linneaus 1758) [*fide* Ahlstrom 1940] [8, 9].
Callidina elegans Ehrbg. 1830 [3, 5].
Cochleare turbo Gosse 1886 [1, 5].
Monostyla mollis Gosse 1887 [1, 5].
Pleurotrocha constricta Ehrbg. 1832 [1].
Ploesoma molle Kellicott 1897 [*lapsus calami*] [5].
P. mollis Kellicott 1897 [4].
Proales algicola Kellicott 1897 [4, 5].
Vanoyella globosa Evens 1947 [22].

GLOSSARY

Alula: Lateral projection of the rami.

Annulated (foot): Composed of a series of annular folds, giving a corrugated appearance.

Apical field: The unciliated anterior portion of the corona.

Buccal field: An evenly ciliated area of the corona surrounding the mouth, which is reduced in planktonic forms.

Circumapical band: A broad band of cilia encircling the outer margin of the corona.

Cirri (styles): Sensory structures composed of enlarged and stiffened cilia originating from the buccal field.

Claw: A pointed extension of the toe.

Corona: Composed of the ciliated buccal field, circumapical band and the unciliated apical field.

Coronal lobes: Fanlike or fingerlike extensions of the corona.

Coronal sheath: The anterior region of the body which envelopes the corona.

Cusps: Small spinelike extensions of the lorica occurring at the anterolateral juncture of the dorsal and ventral plates.

Excretory system: Comprised of paired protonephridial tubules with branched terminal flame bulbs. The tubules discharge into the bladder and function both in excretion and osmoregulation.

Eyespots: Four types are recognized, based on location. The cerebral eye may be single or paired and lies on the surface of the brain. In addition to the cerebral eye, some species have frontal, lateral or apical ocelli which may occur individually or in pairs.

Fide: On the authority of (referring to a published statement).

Fusiform: Spindle-shaped; body tapering at each end.

Germovitellarium: A two-part syncytial structure in the female rotifer consisting of the germarium (ovary) and the vitellarium, which contains conspicuous nuclei. Both parts are bound together by a common membrane which continues as the oviduct to the cloaca. The vitellarium provides yolk material to the developing egg.

Incertae sedis: Of uncertain position.

Lapsus calami: A slip of the pen.

Lateral sulcus: The membranous junction which appears as a cleft between the ventral and dorsal plates of some loricate species.

Lorica: A stiffened intracellular rigid lamina of the body wall composed of scleroprotein. May be continuous or separated into plates.

Mastax: The muscular structure located between the buccal tube and esophagus which envelopes and operates the mouthparts.

Median polygonal facet: A centrally located facet comprising part of the ornamentation pattern on the dorsal plate of *Keratella*.

Mucro: Spinelike projection of the coronal sheath, especially of *Trichocerca*.

Nomen nudum: A name without designation (definition or description).

Pedal glands: Exocrene glands located in the foot which secrete an adhesive substance through ducts leading to the toes. This substance anchors the rotifer to a substrate or assists in locomotion, particularly in creeping movements.

Polygonal facets: Ornamentation pattern on dorsal plate of *Keratella*.

Pustulate: Pimple-like appearance.

Retrocerebral apparatus (sac): This structure may have an exocrene function related to lubrication of the corona. Ducts from the structure open onto the apical field.

Spurs: Small lateral projections of the toe.

Trophi: The mouthparts, consisting of seven basic parts: paired rami, unci, and manubria, and a single fulcrum.

Vitellarium: *See* Germovitellarium.

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